IAVE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

Schools of the future and industrial education: a special report on the administrative approaches to industrial education

(see page 48)

- Suggestions of the Office of Education Conference on Industrial Arts (pg. 22)
- Concepts of Design in I-A Teacher Education, Hardin, Wenrich, and Wright (pg. 32)
- A Closed-Circuit TV System for Enriching Electronics, Brzezinski (pg. 26)

May, 1961

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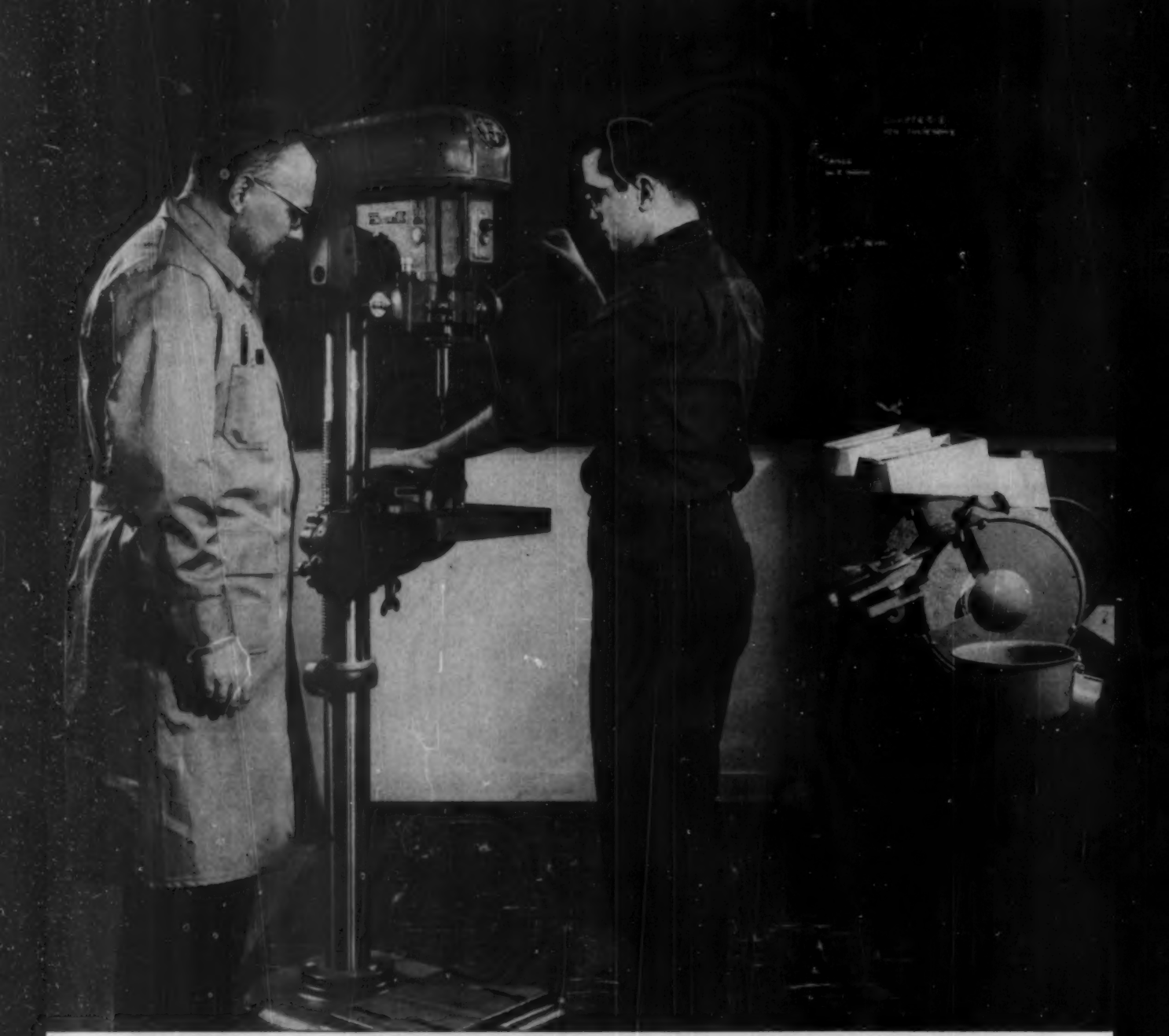

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bulletin board

The **current "situation" in industrial education** is well known to everyone in the field. Since Sputnik the clamor has been for accelerated mathematics and science and foreign-language instruction; the resulting **"crash" expansion in these "solids" has meant a de-emphasis in industrial education — especially industrial arts.** Why cut down on industrial education? Many influences in the schools believe the field is a "frill" and administrators, who have a predominant academic background, do not understand industrial education or do not believe it makes a unique contribution to the rounded high school program.

The **special report in your IA/VE for May** on "Administering Industrial Education" (pg. 48 ff.) is **an attempt to rectify the imbalancing tendencies in this "situation."** To accomplish this, it: **(1) defines industrial education; (2) analyzes how I-E's role in the district curriculum can serve many students in a way no other area of subjects can; and (3) provides data for the administrator to use in "selling" industrial education to boards, citizen groups, etc.** In fulfilling this threefold purpose, it considers several important areas of industrial education — good plant programing, effective teachers, and modern curriculum — all from the administrators' viewpoint.

We hope you will look over the articles in this special report and that **you will be able to present them to your superintendent for his reading.** We hope further that this report might serve as **a common-ground basis for discussion** of the problems of industrial education in a truly crucial time.

Extra copies of the report are available at cost for distribution to your board and administrators.

Among the other features in your IA/VE for May:

1. **A concise review (pg. 22) of the suggestions for a revitalized industrial arts made at the Office of Education work conference** in such important topics as course content, teaching techniques, etc.

2. **A comprehensive approach (pg. 32) to improved practices in teacher education instruction on design** — a major avenue toward more effective presentation of the subject in our field.

3. **An explanation (pg. 26) of the physical structure of a typical high school closed-circuit education television setup** which, operated by electronics students in the I-A program, provides enrichment for them.

These are **the highlights.** We hope you'll have an opportunity to **look over the other half-dozen general articles plus the usual projects** (pg. 30 ff.) with ideas in electricity, metals, drafting, etc.

for June . . .

The final issue of the school year will feature **a detailed report of the AIAA convention in St. Louis** which considered many vital facets of the effect of technological advances upon industrial arts.

the editors

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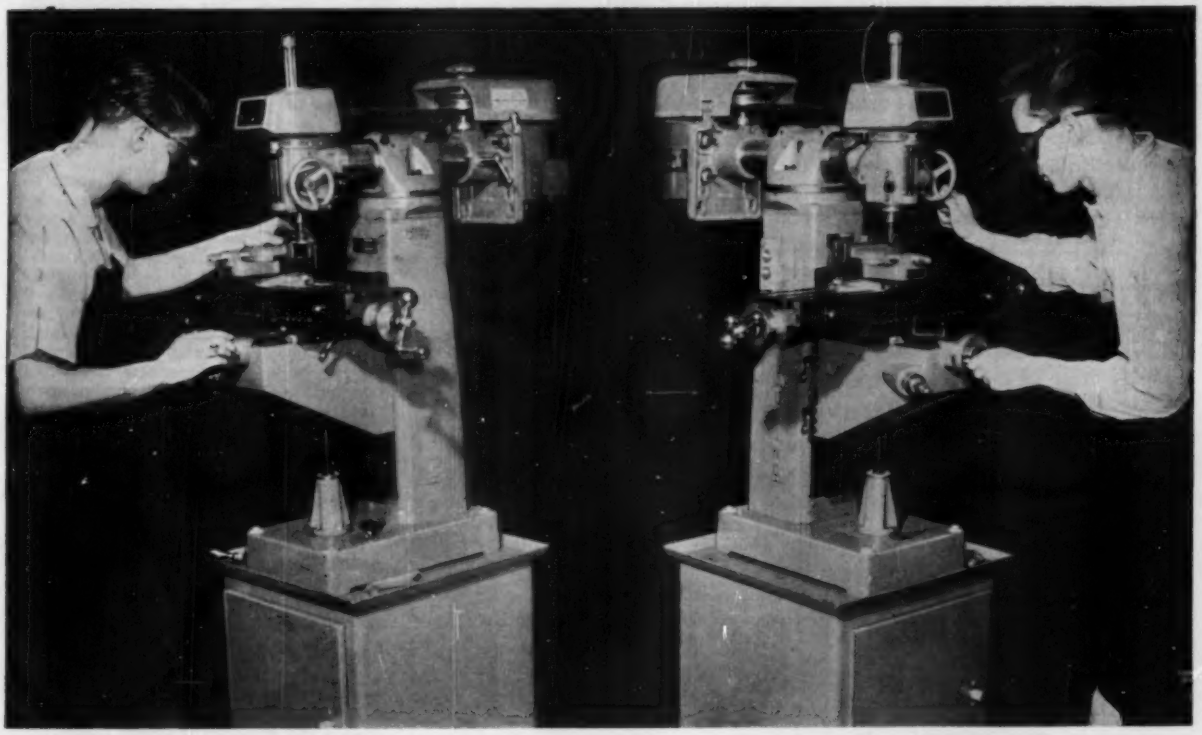

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letters

for I-E use of the library I read your article, "Industrial Education and the Library" (see pg. 11) in the December issue of IA/VE. Congratulations and thanks for a long overdue article. I am having copies duplicated for issue to all instructors. . . . As a librarian, I am especially happy to know your article has come to the attention of those who can implement its proposals.

John W. Hall, librarian, California State Department of Youth Authority, Ontario

for AIAA and AVA unity The reference (see pg. 17 of your IA/VE for February) concerning a combined convention involving the AVA and the AIAA certainly makes good sense. Further, I believe a more extensive combination of efforts needs to be more fully explored. It is unfortunate in education that we have more organizations than we know what to do with; organized to the extent the right hand does not know what the left hand is doing.

For some reason, known or unknown, most industrial arts educators shudder at the mention of vocational education. Likewise, many vocational educators smile with tongue in cheek at the mention of industrial arts. To me this is an unfortunate situation that does not need to exist. In my estimation, industrial arts in the secondary schools is at the crossroads. Industrial arts is looked upon as a stepchild in general education and an illegitimate child in vocational education. This is not by choice but rather by practical reality.

During the past three years, professional publications have featured various suggestions regarding upgrading industrial arts in an attempt to gain status or regain lost prestige in the secondary school program. Basically the ideas have been the same, more science and mathematics and greater attention to individual differences according to ability grouping. I question the desirability of riding on the coat tails of science and mathematics without giving full consideration to major curriculum changes.

In my opinion, the time has come to carefully examine our total program, including objectives, if we are to find a way out of the existing dilemma. I firmly believe the industrial arts program in a comprehensive high school must give consideration to vocational objectives, especially if some areas of the school curriculum are going to meet the pre-employment needs of the non-college-bound youth. The need for pre-employment experience in the last two years of high school is becoming more apparent with the increased attention toward the academically talented student. With increased emphasis on pre-employment education, it is still possible to provide worth while experiences for the college-bound youth electing to take industrial arts.

Preparation for the world of work involves the total school program including industrial arts. In my opinion, all industrial education educators need to be concerned and make every effort to determine the ways and means for increasing the value of industrial arts experiences toward that goal. This is a challenging problem that may have more than one solution—the easiest is to hide our heads under a bushel and disregard the basic issues.

I am confident that, within our ranks of industrial education, we have the necessary "know how" to define the problems and provide the leadership and direction that will lead to the solution of one or more of the major problems facing education.

James C. O'Gara, supervisor, industrial arts, Public Schools, Portland, Ore.

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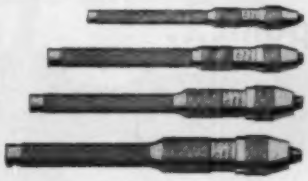

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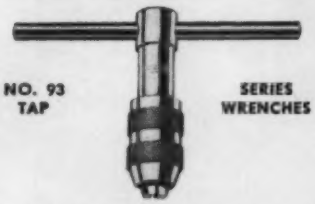

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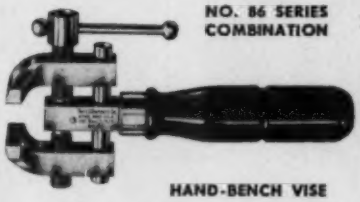

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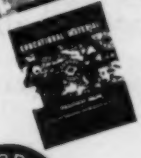

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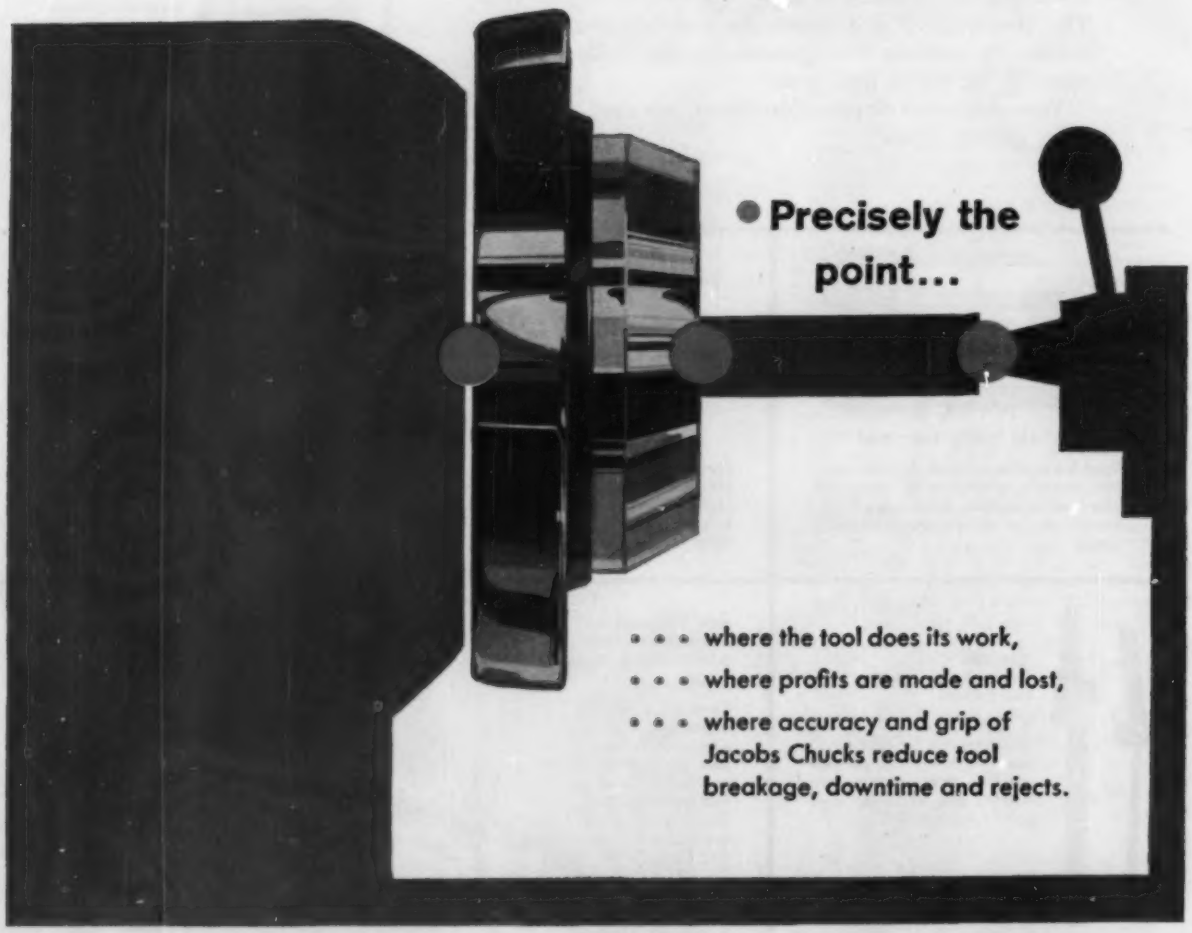
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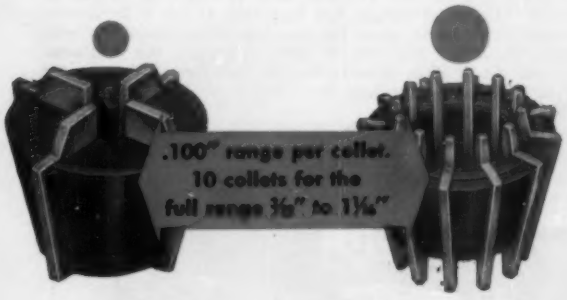

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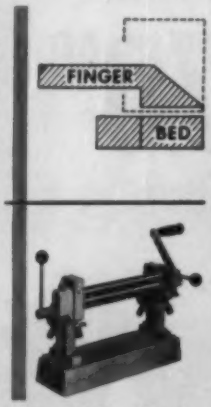

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news

DC dropout program On-the-job training to youths who have dropped out of high school will be a phase of the "industrial arts" program in the Washington, D. C., schools to be started in September. The program will include training in custodial and warehouse and cafeteria areas with special workshops to train helpers in such trades as printing, carpentry, and electricity. This will be coupled with remedial work in English, mathematics, and citizenship courses. Pupils in the program will attend classes in the mornings and work in the afternoons until he is "placed" by his counselors. Once he is, he will be encouraged to complete his education in night school.

AIAA launches Ford awards The AIAA has received an $81,500 grant from the Ford Motor Company to support a three-year industrial arts awards competition for junior and senior high school students. This award, conducted by Ford for the past 11 years, will offer some 1295 prizes totaling $35,000 this year. Requests for further information should be sent to Kenneth E. Dawson, executive secretary, American Industrial Arts Association, 1201 Sixteenth St., N.W., Washington 6, D. C.

schools teach "thinking" only The general manager of the Dodge Division of Chrysler Corp., Byron J. Nichols, said that schools must train students how to think and let industry take over the job of teaching skills. Addressing the Kentucky School Boards Association convention recently, Mr. Nichols said that "The trouble with many schools . . . is that they seldom force the student to exert himself mentally. . . . By providing highly specialized training in the trades, schools are offering what frequently can be better obtained during a young person's early period of actual employment." He further suggested that schools should be "reducing or de-emphasizing some of the hardware, plumbing, and wiring in the curriculum of our secondary schools. . . ." In a great many cases, he said, vocational courses could be eliminated entirely from the school curriculum.

teacher institute The Ninth Annual Institute for Teachers of Machine Shop and Teachers of Drafting was held at The University of Michigan, with headquarters in the Rackham Building, on March 25. The Institute is sponsored by the Department of Vocational Education and Practical Arts of the U-M School of Education. Associate Professor Lee Danielson of the U-M Bureau of Industrial Relations, gave the opening address and discussed "Creative Thinking." Theodore W. Hoover, head of the vocational department, Cody High School, Detroit, was the speaker at the 10:30 a.m. session and talked on "Correlation of School Shops

(Concluded on page 72)

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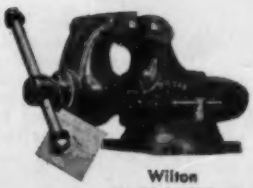
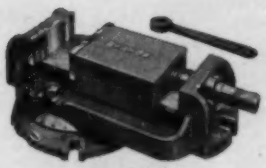


Wilton Machinists' Vises



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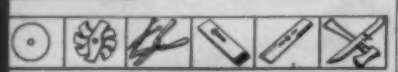

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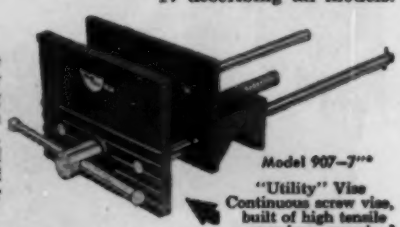

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The almost universal practice of authors of mechanical drawing textbooks of giving too little attention to modern drafting equipment, has resulted in an area of neglect which seriously needs attention. The tendency has been to teach the use of the old, out-of-date T-square and triangle method. Many teachers have expressed the belief that drawing should be taught on the T-square basis first, because it is the basic method, but it is no longer the basic method and the bad habits taught do more harm than good.

The first efforts in training and practice on the drafting machine should be directed toward acquiring the most direct approach. Simple drawings should be made and analyzed to eliminate every unnecessary movement. The drafting machine has become overwhelming choice of industry — more than 75 per cent use this device and the number using the machine is steadily growing. We teachers should teach suitable habits and techniques that will fit the students for industry.

The lack of good equipment at school prices has recently been remedied with the introduction of school size units — up to 24 by 36 in. drawings — moderately priced, yet having professional features and quality. One should remember this is permanent equipment.

The cost to schools for one of the best known machines is around $60, including clamp and scales. Since the machines are permanent equipment, the cost should be adjusted on the basis of other permanent items, such as drawing desks, etc.

Drafting machines are basic for engineering design. They speed and simplify drawing by eliminating the waste motion and distraction of locating and positioning several different drawing tools. Using them up to 50 per cent of the draftsman's time is saved; accuracy is improved; fatigue is reduced; interest is created; and the mind is free to think and draw.

The machine may be mounted to the desk top or to the drawing board, depending upon your local situation. They can be anchored permanently with wood screws or clamped down with an accessory clamp. The method used de-

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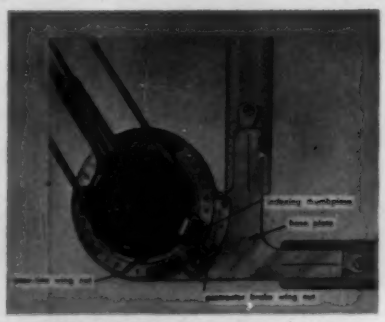

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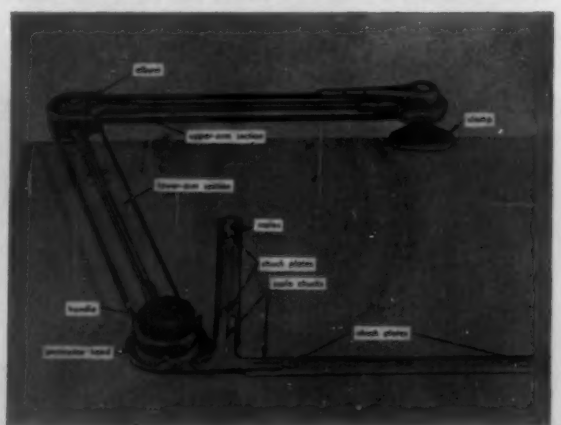

Basic parts of a typical drafting machine: (right) the main parts for the three simple operations of the machine — indexing, setting intermediate angles, and base-line setting; (above, right) the closeup view of the elements of the protractor head assembly.

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Build-a-Course General Shop Series

Walter C. Brown, consulting editor.

Cloth, 8 by 10½ in., illus., $1.76. Goodheart-Willcox, Chicago 5, Ill. Free teachers' guides available with books.

Woodworking, by Willis H. Wagner, 112 pages.

Electricity, by Howard H. Gerrish, 104 pages.

Electronics, by Howard H. Gerrish, 112 pages.

Drafting, by Walter C. Brown, 112 pages.

Leathercraft, by Fred W. Zimmerman, 96 pages.

The first five of a nine-book series for basic general shop. The major feature of this series is its flexibility in allowing the general shop teacher to select only those areas which are included in the teaching program. The books each explore a very wide range of subject matter on the basic or beginning level. In the woodworking text, as an example, there are 15 chapters: (1) planning, (2) selecting and roughing out stock, (3) planning and sawing stock to finished dimensions, (4) making joints, (5) forming curves, chamfers, bevels, (6) drilling and boring holes, (7) clamping and gluing wood, (8) metal fasteners, (9) sanding and preparing for finish, (10) finishing, (11) drill press, jig saw, band saw, (12) jointer, circular saw, (13) lathe, (14) wood, lumber, forest products, and (15) projects. In these chapters there is a stress on activities to teach basic principles in hand and machine work and an attempt is made in many chapters to interpret the industrial procedures being covered.

The books are all attractively printed with such study helps as introductory chapter summaries, safety hints, end-of-chapter quizzes, etc.

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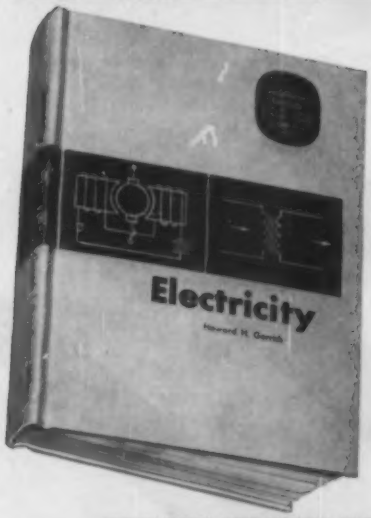

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A Guide to Teaching Industrial Arts, Grades 7–12

Paper, looseleaf, 73 pp. Board of Education, Minneapolis, Minn., Schools.

A product of four years' research and production, this general guide to teaching industrial arts in the Minneapolis schools includes chapters on objectives, philosophy, professional participation, scope and sequence of industrial arts courses, policies and procedures, the shop organization, discipline, individual differences, guidance of students, motivation, homework, evaluation, and safety education. The statements on individual differences, motivation, and guidance are specially well done; the chapters on homework and evaluation set high standards for a forward-looking program in industrial arts — related closely to practices in current industrial fields.

The guide is to be supplemented by six subject area (auto mechanics, drafting, electricity-electronics, graphic arts, metals, and woodworking) guides for the district's 49 semester hours of I-A work. Further, textbook committees are completing recommendations for basic and supplementary resources (texts, workbooks, etc.) to implement the instructional program outlined in the general and the subject matter guides.

The Automobile Engine

By William Weinstein. Cloth, 623 pp., 6¼ by 9¼ in., illus., $7.95. Chilton Company, Philadelphia 39, Pa.

This is another book of Chilton's Automobile Mechanics' Series, which is being developed to satisfy the demands by educators and industry for better automotive texts. By making this new material available to vocational-technical educators, they will be better able to prepare their students for a more successful career in automotive repair and maintenance.

A thorough word-and-picture description of all phases of the automobile engine, with the descriptions presented as an instructor would use them. The book includes fundamental knowledge necessary for the understanding of the purpose and function of all components of the modern automobile engine. It includes essential information on ignition and carburetion which the student must have to understand the engine and its functions. Also described in some detail are the most popular service operations as an exploratory activity for training on the job, in school, or at home. The book includes a glossary of terms and an index.

Electrical Principles of Electronics

By Angelo C. Gillie. Cloth, 532 pp., 6¼ by 9¼ in., illus., $7. McGraw-Hill Book Co., Inc., New York 36, N. Y.

Besides covering the basic teachings of the past in the field of electronics, this book endeavors to include a study of the new timesaving techniques and more accurate devices which have been developed to meet the requirements of present-day electronic industry. It offers an opportunity to use the contemporary techniques as a supplement to the basic concepts. It is written for technical institutes, junior colleges, service schools, and programs in

(Concluded on page 71)

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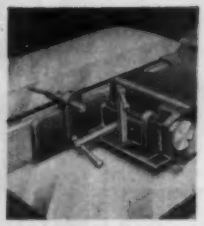

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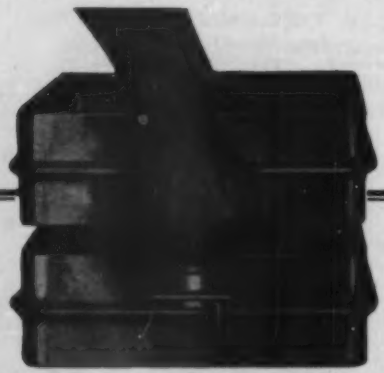

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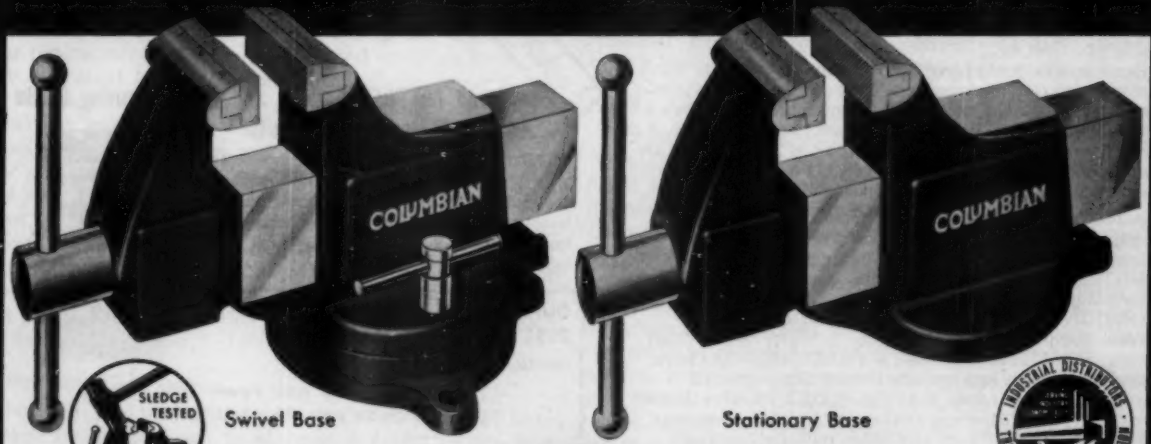

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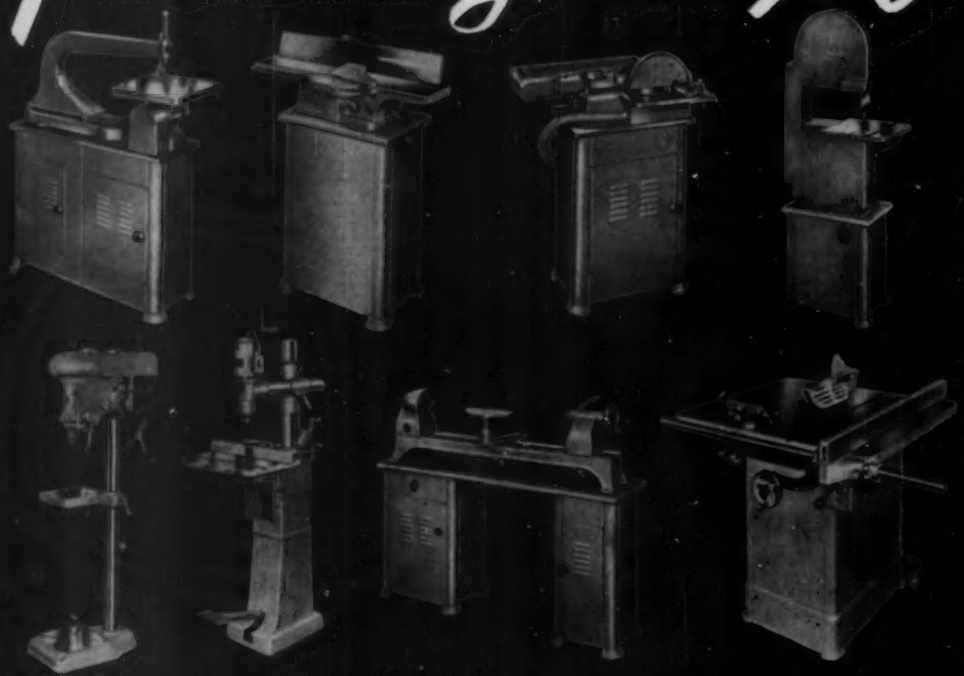

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THE ADMINISTRATOR AND YOU

The major portion of this issue is intended for your boss; we hope that you will take it upon yourself to show your administrator this special report.

As you well know, many administrators do not fully understand the objectives and purposes of our programs. Nor do they appreciate the differences in the three separate, but mutually dependent, areas of industrial education: (1) industrial arts, (2) vocational-industrial education, and (3) technical education. Many other administrators need to be reminded of the values that these programs bring to the total school program. It isn't necessary to remind you of changes that have taken place in our schools during the few years since Sputnik. Most of you are experiencing these changes very vividly.

Industrial Arts on the Downgrade

The change toward a hard core of content dominated by special emphasis on science and mathematics has been spectacular. So many experts have told us what is wrong with our schools that the average administrator feels an unusual pressure from local, state, and national groups. In this upheaval, there are many instances in which industrial arts programs have suffered, especially at the junior or intermediate school level. Even some of our own leaders are beginning to think that we must settle for average, or below average, ability groups. Part of the difficulty is due to the fact that we have not been vocal enough in selling the importance of our programs to our administrators. In many cases, we have not used the ammunition at hand to demonstrate to our bosses that our programs are essential to the good of all students and are important to the general welfare of the country.

In many respects, we live in very peculiar times; the situation is indeed paradoxical. We read that the "new frontiers" of the sixties will demand greater skills from our students. We know that technological change demands the very best in the way of the technically educated student. However, at the same time, we are witnessing in many of our schools the elimination of the teaching of "know-how" of technical life. Yet, simultaneously, our own government is spending millions of dollars in foreign aid programs helping other countries to learn this same technical "know how."

A Valuable Contribution

Now is the time for us to remember that we have something good to sell to our administrators. Ours is a "product" that has strong student appeal, is essential to the economic welfare of our country, and is valuable to every citizen of an industrial democracy.

We have not made a good case for our program before the people who count — the administrators, the school board, and the public. We have not appealed to the people who hold the purse strings. In the final analysis, every program, every shop, every piece of equipment, and every teacher requires money. *You* don't need to be convinced that these are good programs, and you don't have to convince your fellow shop teachers. The ones who need convincing are the people of your community. Some need an introduction to industrial education. Others merely require a refresher.

With the increased emphasis on science and mathematics, the administrator faces the problem of dividing out the available time in the school day. He must determine which areas are to be represented and how much time will be given to each. Today, academic educators have convinced administrators that such "solids" as science, mathematics, English, etc., should get the "lion's share" of the time. We have allowed these people to convince the powers-that-be that greater emphasis should be given to these other areas of education. This in turn has given us less. It is not a matter of being "against our program," but it works out to be the same thing. So much of the school day has been captured by other subjects that there just isn't time left for students to take part in our programs. Also, a good many of our administrators are academically trained with little or no experience in the area of industrial education. Because of their greater understanding of and sympathy for the academic areas, they give more attention to such subjects as science and mathematics. In addition, many of our school boards represent the professional groups in our communities who still consider high school as an exclusively college preparatory program.

For the Administrator

We are trying to do our part by making this special report available to you. It won't do much good if you alone read it; make sure that your principal, your superintendent, and your school board get a chance to see it. Let's let these people know the great values of education for and about technology. Let's give them an opportunity to see that our programs are every bit as important as education about and for science. Let's remind them of the importance of a skilled working force and an intelligent consumer in this technological age. It would be a great help if local, regional, and state groups were to make this special report available to each and every interested person. Extra copies are available for this purpose. Send for them. Use them.

John L. Feirer

Additional copies of the special report, "Administering Industrial Education" (which begins on page 48), are available for distribution to superintendents, board members, citizen groups, etc. Please send 25¢ for single copies, 20¢ each for 10 or more copies.

▶ **Leaders in I-A analyzing key problems in the field:** ..last summer's OE work conference deliberated upon ..avenues toward a **revitalized industrial arts program.**

▶ The following paragraphs record the **positive approaches suggested.** The ideas they express represent a "call to the profession" to establish a series of **local level conferences centered about these topics** to replace proper emphasis upon industrial arts. Finally, they should also cause **each teacher to scrutinize his efforts** in line with the recommendations in order to achieve optimum programs.

Positive Approaches to Issues in Industrial Arts

Two views of the leaders in industrial arts who took part in the Office of Education's work conference to forge guidelines toward more effective, future-looking programs in the I-A field.

1. Concerning the Culture

Industrial arts, as a curriculum area, encompasses a segment of man's knowledge representative of his finest achievements, namely his capacity to create and perform techniques.

Brought up to date in a modern setting many of the keys to understanding the problems among nations, matters of national defense, of community and personal health, of communication, of transportation reside in knowing something about the ways of industry. No one can read effectively the daily newspaper, the weekly news magazine, or an annual stockholder's report without some understanding of productivity, of the origins and applications of inventions, of production techniques. Similarly, the pleasures of everyday life are withheld from those who do not appreciate the finest of man's ceramics, silverware, furniture, graphic arts as well as the precision products of a modern industry.

Public education in the United States of America should be committed to the discovery and development of the talents of all boys and girls regardless of the nature and extent of the talents so long as the talents lie within socially accepted patterns. These talents among the many may be literary, mathematical, aesthetic, mechanical, or scientific.

The case for industrial arts in American education is, that when properly presented as a discipline, it does represent at several maturity levels a challenge to a pattern of abilities which part of the population possesses. This cultivation of these abilities is essential to national progress and security. These abilities are essentially creative and expressional in nature. When combined with complementary abilities of abstraction, in mathematics, in science, or in the arts, the result is persons capable of inventive genius and effective production.

— R. Lee Hornbake
University of Maryland

2. Concerning Objectives

Education for the individual may be divided into the following areas: (1) communications (language, English, mathematics), (2) the theoretical sciences, (3) the social studies, (4) the humanities (fine arts, literature), and (5) applied arts and sciences (agriculture, business education, home economics and industrial arts). Each of these areas is a part of the experiences leading to the complete integration of the individual into the society in which he lives.

In this reference, we find industrial arts occupying a position similar to several other areas which have as their function the development of meaning through application to the occupational

and productive activities of our society. The student who is truly educated must know more than the theoretical aspects of communication, science, art, government, etc. He must build relationships among these and develop a sense of their purposes. Since industrial and related activities are very important in the present age, a study of the application of art, science, economics, sociology, etc., in the engineering-planning-production sense, gives meaning to many of the other areas and provides orientation for selection and preparation of an occupation.

In answer to the question, "What objectives should be emphasized in industrial arts," the following four were selected:

1. To develop in each student an insight and understanding of industry and its place in our culture.
2. To discover and develop talents of students in the technical fields and applied sciences.
3. To develop technical problem-solving skills related to materials and processes.
4. To develop in each student a measure of skill in the use of the common tools and machines.

— Ivan Hostetler
North Carolina State College

3. Concerning Curriculum Guides

Guides determine directions. For industrial arts curriculum development there are two choices of guides: we can choose those which look backward or those which look ahead. If we will find our way out of our present dilemma, it appears that we had better discard the guides we have been using for half a century. The old ones have been leading us in circles and as a result, we now have essentially the same curriculum with which we started. It is imperative that industrial arts follow a new set of guides if it will make any significant contributions to American education in the years ahead.

Industrial arts is a study of the technology, its origins and development; its technical, consumer, occupational, recreational, social, and cultural nature and influences through experimenting, creating, designing, inventing, constructing, and operating with industrial materials, processes, and products; for purposes of acquainting the student with his technological environment and aiding him in the discovery and development of his own human potential therein.

— Delmar Olson
Kent State University

4. Concerning Soviet Polytechnic Education

This report reveals that Soviet educators feel that their practical arts courses are vital to Soviet pupils; as vital as mathematics, science, foreign language, etc. These practical arts or *polytechnic* courses, as they are called in Soviet terminology, are required of all students as a part of their general education.

The idea that there is no dividing line between pure physics and applied physics, between pure mathematics and applied mathematics, puts mathematics, science, and the user of these disciplines — technology — on a more balanced basis. This has implications for industrial arts education, since it deals in technology, to become even more closely connected with these disciplines. This would imply that industrial arts should be more experimental and more scientific, especially for those students aspiring to be engineers and scientists.

— Marshall L. Schmitt
Office of Education

5. Concerning Relationship to Other Curriculum Areas

Experiences unique to the field of industrial arts have reinforced, applied, and extended: (1) language arts, through the use of instruction sheets, technical books, and reference material as well as through the introduction of words and terms relating to industry; (2) scientific principles, through activities and related instruction; and (3) mathematics, through activities requiring mathematical solutions.

— Robert L. Woodward
California Department of Education

6. Concerning the Gifted and Slow Learner

Mathematics classes in many secondary schools today are designed for students of varying abilities and objectives. Such mathematics courses for those high school students who are preparing to enroll in an engineering college and who have the ability to succeed in such an endeavor are quite different in content from those classes which have been developed for slower students with other objectives.

Our problem in industrial arts is similar. Drafting and shopwork for those who will enter engineering colleges should not be the same as courses planned for students who will enter a trade, a vocational-industrial training program, or employment as production workers. Instead, industrial arts courses should vary in content and in projects to be constructed or completed.

— John A. Jarvis
Stout State College

7. Concerning Curriculum Changes

Industrial arts, in the curriculum of the schools of the sixties, should include the better elements of our basic program. We should build into our program those segments that need strengthening or revision, and eliminate those segments that do not contribute to our aims and purposes. A practical approach is needed, not one that says "throw out what we have been doing and start over." Fifty years of steady progress in industrial arts education cannot be overlooked in light of present day technology and needs of students.

The amount of woodwork being taught under the name of industrial arts is out of proportion to its relative value in the curriculum area as a whole. Some schools are including crafts at the expense of subject matter which represents the "solids" in industrial arts.

The word *shop* needs to be dropped from our vocabulary as a subject and especially from being listed on student and school schedules. Industrial arts as a general curriculum area or the course itself should be used. The junior high school seems to be the main offender in naming our offerings.

— Morris J. Ruley
Tulsa, Okla., Schools

8. Concerning Teacher Competencies

Papers prepared for this conference and many others recently published strongly suggest the necessity of acknowledging two important limitations as one considers the question of competencies needed by industrial arts teachers to meet the challenge of the future: (1) It is completely unrealistic, in fact little short of an absurdity, to assume that a given industrial arts teacher can be prepared to function effectively at all age, grade and ability levels, can teach competently all industrial arts subject areas, and can achieve the central as well as all the secondary objectives in the kind of program which is being envisaged. (2) To assume that an industrial arts teacher can be prepared within the limits of a four-year college teacher education curriculum to function effectively in a given phase of the quality program envisaged here is equally unrealistic and absurd.

Positively stated, then, it seems essential that some degree of specialization be assumed and that a distinction be made among the special competencies required of the various industrial arts instructors if each is to function effectively in a particular phase of the industrial arts program. Further, five years will be assumed to be the minimum length of time in which an industrial arts instructor can be prepared to do a professional job in his field.

— M. Ray Karnes
University of Illinois

Determining Content in Industrial Arts

ROBERT G. HAMMOND

One of the prime issues facing us in planning for space-age industrial arts is: What to teach? What experiences in industry should be selected for the classroom and laboratory?

Here is a concise compilation of what leaders in the field have thought about this problem of subject matter — as a guide toward current and future discussion.

There has been rather universal agreement among industrial educators for some 50 years that industrial arts can, and should be, representative of our complex industrial society. It generally has been agreed also that the fundamental source from which to select industrial arts subject matter is obviously industry itself. Prominent leaders have agreed, likewise, that, in its capacity as general education, industrial arts must do more than provide mere experiences in the manipulation of tools and materials. There is perhaps no better summation of this viewpoint than that provided by the leadership of the American Vocational Association in 1953:

> The general education scope of commitment precludes limiting industrial arts instruction to manipulative construction activities alone. Industrial arts, as a subject area in our schools, should use as its points of departure all phases of our industrial life which can be dealt with in a school shop or laboratory. These several points of departure — that is, the materials, tools, and processes of industry; science and inventions applied to industry; the social and economic contributions of industry; and, the human relations patterns fostered by industry — define the scope of the industrial arts program.[1]

It is unfortunate indeed that the problem of determining just what part of the total industrial content to retain for school use has not been so readily discernable and agreed upon. Ericson wrote that the availability of such extensive curricular materials as is represented by this industrial world may tend to confuse rather than assist in the solution of the problem. He asked the pertinent question: "Which one of the many suggestions that industry may offer shall be accepted, and upon what basis shall the details of the subject be selected?"[2]

There have been suggested several diverse methods by which the subject matter (as represented by tool skills and related information) of the industrial arts has been previously earmarked and retained for instructional use by the schools. Wilber[3] mentions three such approaches, the first of these being the "trade analysis" approach. The second method would permit "student interest" to dictate the content of a particular course, and the third method was dependent upon the enthusiasm, hobbies, avocations, or "teacher interest" to set the pace of the work.

London[4] has stated four major approaches to the problem of deriving content for the schools: (1) statements of fundamental premises about individual and social needs have served as the basis for curricular "experts" to prescribe educational content; (2) expressions of educational needs and interest obtained from the recipients of education have served to determine what was taught; (3) "third parties" such as employers, parents, subject matter specialists and the like have been asked to outline the content; and (4) life's activities have been analyzed to ascertain what people must know and be able to do in order to perform those activities.

"Industrial Arts," he said, "makes some use of all four approaches."

Despite the availability and possible

[1] American Vocational Association, *A Guide to Improving Instruction in Industrial Arts* (Washington: The Association, 1953), p. 11.

Dr. Hammond is an associate professor, industrial education department, Northwestern State College at Natchitoches, La.

[2] Ericson, Emanuel E., *Teaching the Industrial Arts* (Peoria: The Manual Arts Press, 1946), p. 270.

[3] Wilber, Gordon O., "A Method For the Selection of Industrial Arts Activities," *The Education Digest*, 10:53, Apr., 1945.

[4] London, H. H., "What Should We Teach in Industrial Arts?" in George S. Reuter's *Methods of Teaching & Presenting General Education Subjects* (College Heights, Ark.: George S. Reuter, 1955), p. 47.

use of such methods as the above, a very superficial survey of the professional literature in the field leaves little doubt that only one of the methods has been used extensively. Industrial arts educators have relied to a great extent, for the better part of four decades, upon the analysis method as used in trade education, for the derivation of subject content. Such prominent writers and leaders as Bennett, Griffith, Ericson, Selvidge, Fryklund, and Friese have all voiced the opinion that analysis of occupations, jobs, processes, or unit operations in industrial life was the only basis upon which industrial arts subject matter should be based.

The popularity of analysis stems from the early days of manual training, and in reality the analysis forms still used today in industrial education are little different from those described by Bennett in 1932 as a ". . . further development of the analysis of the mechanic arts which was at the foundation of the Russian system."[3]

The earliest classification of subject matter in manual training classes, like that of its Russian predecessor, was taken directly from industrial sources and specific trades. Based as they were upon the mere mastery of tools, materials, and problems of construction, and taught chiefly as a means to mental discipline, the early courses proved within a few years to be unsatisfactory. They were narrow of scope, formal in organization, and made little or no allowance for individual initiative or originality. Bennett[4] called attention to the fact that the recognition of the differences among individuals and the desire to adjust the program of the school to these differences was in no small way responsible for a changing concept concerning the nature of content in manual training. The subject came to be viewed as having both depth and breadth of content rather than just breadth. All students continued to cover similar basic units in a course, but considerable variance was provided for in the amount of penetration into the depth of the area which a student might make. "Out of this idea," said Bennett, "developed the plan of arranging the manual training course in groups of things to be made and facts to be learned . . ." with each group teaching the use of tools or the application of principles or processes in construction or both.

Perhaps the most influential publication concerned with the analysis method in the selection of subject matter in industrial arts was the American Vocational Association bulletin, *Standards of Attainment in Industrial Arts Teaching*. The extensive lists of teaching units presented in this volume and in its 1946 revision[7] were divided into three principal groups: "the things you should be able to do," "the things you should know," and "the things you should be." The first group involved manipulative skill, knowledge of procedure, and constructive processes. The second group involved information concerning qualities and characteristics of materials, together with other matters of general interest in the field. The third group involved attitudes and habits which affect the success of individuals.

This plan for the selection and arrangement of content for industrial arts courses was supported by the prevalent concept that all successful shop instruction must be based on some plan of teaching fundamental learning units. This idea was very strikingly expressed by Selvidge five years prior to the publication of the AVA publication. In part, he wrote:

> There are certain fundamental skills, attitudes and habits that are common to many types of work and that may be developed in one type of work almost as well as in another. The emphasis, therefore, should be placed upon the things we wish to teach rather than upon the things we wish to make. Neither broad general objectives nor a list of projects constitute a satisfactory program. Our program should be expressed in terms of the information, the attitudes, the interests, the skills, and the habits of work we expect the boy to have when he had completed his period of training.[8]

Industrial arts educators have, from the first, continued to accept the concept that no matter what the course or the methods used, all content must be selected on the basis of whether or not it contributes to the over-all achievement of the specific objectives established for the students involved. In recent years the objectives established for industrial arts have tended to become more and more blended with those of the total school program. As a consequence of these changes, the emphasis in content has been placed on related scientific knowledge and social habits rather than upon manipulative skill as was formerly the case.

Accompanying this modification of content, there has been some expression of discontent concerning the continued use of industrial analysis techniques in selecting the specific content to be taught. Among the first dissenters was Gordon O. Wilber. He defined proposed objectives of industrial arts in terms of the changed behavior on the part of students, and he would test the suitability of subject matter by evaluating it against the question, "Does it contribute significantly toward bringing about one or more of the desired behavior changes?"[9] Of this, he wrote:

> If the answer is "yes," then that item may well become a part of the subject matter. If, on the other hand, the answer is "no," then — regardless of how interesting or desirable that particular item may be — it should be rejected.

Friese has written of this trend to discredit the analysis method for industrial arts purposes and lists some stated objections to course analysis techniques. Among them, he included: (1) the circumscribing nature of analysis, with its tendency to make a course lose its freshness; (2) its tendency to prevent student initiative and original planning; and (3) its non-adaptability to general industrial arts. He goes on to say that all of these objections have degrees of validity if the analysis techniques are used in their traditional forms. He points out, however, that ". . . so far our professional writings have not provided much help in the form of substitutes for or modifications of the original forms of analysis.[10]

One modification has been presented by an influential committee of the American Vocational Association. The 1953 revision of the AVA bulletin on industrial arts instruction[11] abandoned its former unique curriculum approach and does not include the traditional lists of teaching units relative to "What You Should Be Able to Do," and "What You Should Know." The committee chose instead to examine, in part, nine objectives for industrial arts, listing for each suggested behavior change meanings (classified as skills, knowledges, attitudes, or values, appreciations, and special abilities) and their associated learning activities.

The listing of numerous "learning activities" for each desired behavioral change is, according to the AVA Committee, synonymous with the listing of instructional content. It is suggested in the bulletin that each teacher, together with his individual students, choose the activities which are most appropriate for the student in the light of his ability, interests, community needs, etc.

[3]Bennett, Charles A., "Back in the Nineties," *Industrial Education Magazine*, 33:282, May, 1932.
[4]*Ibid.*, p. 283.

[7]American Vocational Association, *Improving Instruction in Industrial Arts* (Washington: The Association, 1946).
[8]Selvidge, Robert W., "What Shall We Teach," *Industrial Education Magazine*, 31:43, Aug., 1929. Later reproduced in Selvidge, Robert W., and Verne C. Fryklund, *Principles of Trade & Industrial Teaching*, 2nd ed. (Peoria: Charles A. Bennett Company, Inc., 1946), p. 36.

[9]Wilber, Gordon O., *Industrial Arts in General Education* (Scranton, Pa.: International Textbook Company, 1948), p. 58.
[10]Friese, John F., "Analysis of Course-of-Study Materials for Industrial Arts," *Industrial Arts & Vocational Education*, 42:208–211, Sept., 1953.
[11]American Vocational Association, *A Guide to Improving Instruction in Industrial Arts* (Washington: The Association, 1953).

A Closed-Circuit TV System for Enriching Electronics

WALTER H. BRZEZINSKI

- Educational TV is a recognized aid toward improving instruction through student viewing. However, **ETV can also enrich instruction by having students operate the equipment.**
- Here is a **report of one such setup,** — its equipment, studio, control room, etc.

In our new school, a closed-circuit television system is a part of the electronics program. Rather than discuss the function of educational television or the values in instruction received by the electronics pupils participating in our program, I would like to describe our setup as a guide to others interested in this type of arrangement as an adjunct to their industrial education programs.

The System

Our system is the radio frequency type in which any standard television receiver may be used to view our closed-circuit program. It is amply connected by taking the antenna connections from the television set and connecting them to our closed-circuit antenna system. We can originate a program from about any room on the campus of our high school. The video console, the three monitors, the two cameras, and the audio system are mobile.

The audio system is universal and can be used to communicate through the hand sets which are placed on the walls of each classroom or through the public address system. We can connect the portable audio system to the console and hear the audio through television sets in the different classrooms. Our talk-back system allows pupils that are not housed in the same room as our program lecturer to ask questions and receive an answer from the program lecturer if so desired as if they were all in the same room with the lecturer. The lecturer has a control by which he can turn the talk-back system off so as not to be interrupted by the pupils.

The Studio

The floor plan will give you an idea of how the studio is laid out and how the studio control equipment is placed. The area may be divided by the use of portable flats to make a number of studio scenes which may be televised by either of our two cameras during the program. We have a corner of the studio which can be used for programming any function requiring water facilities (a portable folding laboratory may be used).

Near the ceiling is a grid-work of pipes where scoop lights and spotlights are mounted and can be moved about to obtain proper lighting for each specific scene. The pupil responsible for the lights does research on lighting in our shop, school, and town libraries. The pupil will write up this report and pass it to the instructor to read and make comments.

All pupils of different areas — video, audio, lighting, etc. — report on their areas. The pupils (television technical crew) will rotate so that they may have an opportunity to know about as many phases of the studio work as is possible to cover.

Our setup utilizes two camera men. One uses a 1 in. or 2 in. lens and the other uses the 3 in. lens for close-ups. Each camera man has a cable man so that the camera man may move the camera to any part of the studio without any fear of running over a cable and thus making the picture on the screen jump.

The pupil on the camera will conduct research on the function of the camera. Such phases as the electrical block diagram of the camera, its function, the physics of lenses, etc., will be ex-

Mr. Brzezinski is an instructor of electronics at the Concord-Carlisle Regional High School in Concord, Mass.

plored to enable adjustment of the lenses of the camera to obtain the results desired by the director.

The studio microphone man sets up microphones in the proper places for scenes that are to be taken. It is necessary for this student to know different types of microphones and their characteristics. Sound effects will be handled by the studio microphone man or the audio man in the studio control room.

Studio Control Room

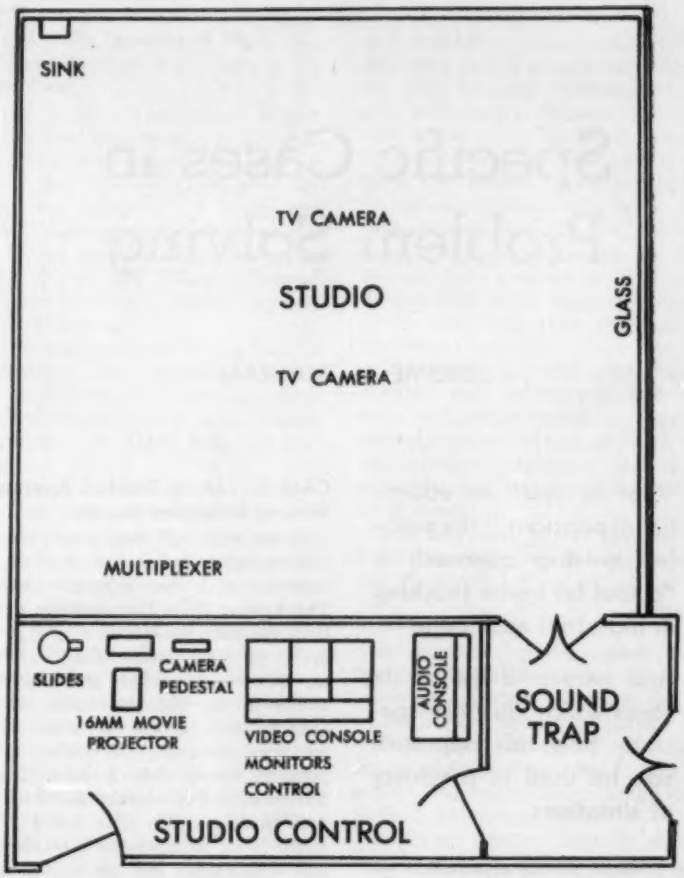
The video console consists of three monitors for the two cameras and for outgoing picture information. On sloping panel of the video console is an "A" scope wave form monitor, an instrument which adjusts the video panel controls to obtain the best picture under different operating conditions of the studio. The director, stationed behind the operator of the video panel, directs the entire show.

Using our 16mm. film projector, classroom teachers may see the film through the closed-circuit television system. Directly in back (in line) of the movie projector, we have a slide projector which holds 18 2-by-2 in. or 35mm. slides. We can load the slide projector and thread the movie projector. On the console a light will light showing the pupil that the slide projector and movie projector are ready for showing. The slide projector or the movie projector can be controlled from the console; the console operator can switch at will the movie projector, the slide projector, or the program in the studio.

On our audio panel are switches enabling us to connect electrically with every room of our high school. Below the switches is housed an AM-FM tuner. Below that we have an all-speed record player. On the right side of the panel are controls to set the audio level to the desired amplitude. A tape recorder can be plugged into the panel to record or send out a taped recording.

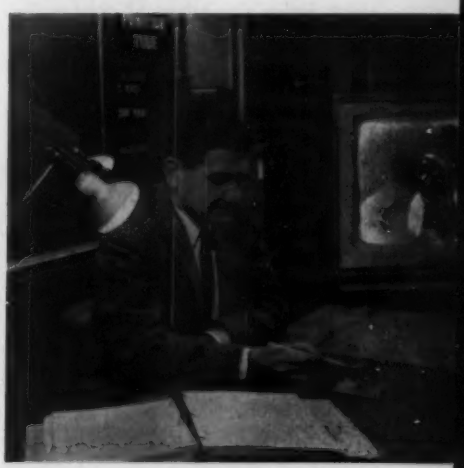
We have two separate audio channels: on one we can send a radio program to any one or any number of rooms; on the other channel we can send out a taped recording, a record, or by the use of the microphone, make an announcement either to one or any other rooms that are not listening to the radio program. With the use of a hand set we can call the main office or to any of the other four special areas without disturbing the other two channels.

This has not been an attempt to explain in detail how our closed-circuit television system may be used for programing. In addition to its use in the industrial arts program, we plan a course in industrial arts for college pupils. The program will be a series of short tours through our industrial arts departments. With this program we hope to entice the college pupil and show him some of the functions of the industrial arts.



With this new medium in school, a great number of students in the school system will gain in the knowledge and understanding of the importance of industrial arts in our fast-moving world.

closed-circuit television: for better teaching in industrial education—



In the industrial education department at Southern Illinois University at Carbondale, professor Fred Culpepper has adapted the school closed-circuit TV equipment for use as an audio-visual aid in single classroom teaching. The view at the right indicates how one major advantage of TV — that of magnifying small objects or charts, diagrams, etc. — is a "natural" for I-E courses. Very modest equipment includes a small camera and receiver for this demonstration-enricher (and time saver) use.

Specific Cases in Problem Solving

JEROME M. MALKAN

- "Not in itself an educational panacea," the problem solving approach is "a tool for better teaching in industrial education."
- And here is a list of six cases which illustrate specially how this approach can be used in a variety of situations.

The problem solving approach is not in itself an educational panacea but rather a tool to better teaching. In the problem solving approach the student learns while trying to solve a specific problem. The problem is usually a concrete one either self or teacher motivated. One of the teacher's big jobs is to *help* the student identify and specifically define the problem. The teacher then serves as a resource person and at crucial points guides the student down the proper path to a satisfactory solution. Many problems incidental to the main one are encountered during the course of solving the original problem. Many various things are learned by the student as he seeks the final solution. Properly used the problem solving approach can bring meaning and enjoyment to the learning process for many students. This method of teaching may be used with one or two selected individuals, a small group or an entire class at any given time. It does not preclude other methods or techniques but rather complements, supplements, and enhances them.

To illustrate this technique let me cite several examples of how this method has been used in the past.

Mr. Malkan is an instructor of industrial arts at the Mamaroneck, N. Y., High School.

CASE 1: Using Problem Approach With an Individual Student

In my electrical shop course the author recently used the problem solving approach with two different students. The first of these two students was in both the author's electrical course and in his physical science class. Although he was of somewhat above average ability in the electrical course he was unenthusiastic about the work. When we were discussing electronics in our physical science class, however, he was interested and voluntarily answered several questions. He also asked if he might bring in his father's oscilloscope and demonstrate its use to the class. Even though we have one in our science department and it was to be used later in the week, he was encouraged to bring his father's. Later discussion revealed that his father worked in the field of electronics but that the lad had never before been particularly interested. Now, our use of the oscilloscope and our class discussion had piqued his interest sufficiently for him to want to learn more. He was reading a pocketbook on electronics but eagerly accepted the loan of a book on basic radio brought from home the next day.

This, then, was the beginning. The rest of the term in electricity this student took his class notes with the rest of the students and then worked on radio and TV during the rest of the period. The problem we had mutually agreed upon was that he try to learn all he could about radio theory and practical radio and TV repair. He studied every book we had on the subject, built a number of elementary sets, and then studied and worked on troubleshooting and repairs. In the meantime he obtained a part-time job after school in a radio repair shop. He was so interested and willing that his employer sent him to a transistor school during one of our holiday vacations. He was graduated last June and is now working full time as a radio-TV serviceman. The problem solving approach in this instance aided the student to uncover a basic interest and aptitude and served to guide him into a career.

Case 2: Another Example of Using This Approach With an Individual Student

An article appeared in one of the shop magazines a couple of years ago briefly describing the construction of a soldering gun. A quick reading revealed a number of problems one would have to solve before constructing this project. It seemed ideal for capable shop students last year who obviously needed a challenging project. Although he was warned about some of the difficulties he would encounter in constructing this project, he was intrigued with the idea of making his own soldering gun. After studying the article he went to work and stayed with the project until he successfully completed it. In doing so he encountered and solved all problems of jig construction, obtaining materials not available in shop and devising substitutes for those he could not obtain. What is of even greater import is that he was so pleased with himself and his accomplishment that he subsequently undertook problems of greater complexity. He spent a very meaningful year in our shop, a year crammed with fine educational experiences on his own ability level.

CASE 3: Using This Method With the Individual or the Small Group

Two years ago twin brothers enrolled in the author's transportation course. Both boys turned out to be superior shop students. It soon became apparent that the regular work of the course was not sufficiently challenging to their above average abilities and that they should be given a practical problem to work on, one that would call upon their ingenuity and initiative.

The boys were told of our need for a teaching aid in the shop that would illustrate all the lighting circuits of an automobile. The mock-up had to work and all the circuits had to be easily distinguishable. When asked if they would like to undertake the project they readily accepted. They were given a copy of the diagrams of the basic circuits taught and several references.

From there on the boys went to work on their own. After a few days they had decided not to build anything like the projects they had read about. They also abandoned any idea of using full-sized parts from a car we were in the process of taking apart and junking. They then proceeded to design and construct a board three by four ft., fabricating as needed their own parts for each circuit to represent the full sized article.

The project was a big success. It took several months to complete. When it was completed a further problem was posed to two students. Since the project was so successful it should be put on display for the entire school to see. Wouldn't the board show up better therefore, if it could operate automatically as well as manually? Both boys eagerly seized the challenge. We discussed their using an electric-clock motor to make a distributor that would operate in turn each of the circuits. They then set to work. This was a long and complicated task. Among other things it involved redesigning circuits to prevent feedback and yet keep the face of the board looking the same as before. Since the term was almost over the two boys continued this project the following term in the author's electrical course.

This entire project was a very rewarding experience to both students. They learned many things from their work. The project was entered into competition at the Oswego State Teachers College Annual Spring Conference and won a second place award.

CASE 4: The Technique as Used With a Class

Several years ago the author taught graphic arts for a period of five years in a New York City junior high school. The school was in a depressed socio-economic area and students came from homes which lacked a rich cultural background. Under such conditions the teaching of the graphic arts was a difficult area to motivate. To keep the course interesting, the group problem solving approach was used and frequently combined with the integration and correlation of several subject fields. In this manner the enthusiasm generated in the graphic arts shop was carried over into the students English, science, social studies, and art classes.

The device used in this area was the production of a printed book. The students selected the topic and then "carried the ball" from there on. They made arrangements with their English teacher writing the compositions as part of their regular work, with their social studies teacher doing basic research, and with their art teacher designing the linoleum blocks in art class. They divided the work up and each set type, cut linoleum blocks, made proofs, proofread, corrected errors, locked up the work, operated the press and bound the books. The teachers involved had several meetings but mainly it was the students themselves who carried the project forward. In this fashion we produced a number of booklets during the years which were all very popular with the students themselves.

CASE 5: An Example of This Technique Applied to a Closely Allied Field

Today there is tremendous interest in science and a great deal of emphasis on working more science into the industrial arts program. Last year the author was requested to teach two physical science courses. Both classes meet in the shop but they are regular science classes and follow a science curriculum covering chemistry, physics, and earth science.

As we began our study of a unit in Meteorology, the possibility of the class setting up and operating their own meteorology station using instruments they made themselves was discussed.

The class entered into the project with much enthusiasm. They did most of the work on their own after school hours both at home and in my shop. An occasional class period was given over for project work. The class produced a number of weather instruments, such as sling psychrometers, aneroid barometers, wet and dry bulb thermometers, plus many charts and graphs. The class learned a great deal about weather forecasting from this problem solving approach experience and greatly enjoyed the process of learning.

This year we are once again using the class assigned-individual problem solving approach with the physical science classes but are broadening the topic. They may now construct any scientific project that can be produced in our industrial arts laboratory. Some of the projects that have already been selected are an automobile ignition system, a photoprint box, a rat maze, a telescope, and a sextant.

CASE 6: A Further Example of This Technique Applied to a Different Field

Another illustration of how the problem solving approach was used in a field many industrial arts and vocational education teachers have class assignments in, involves the author's teaching driver education along with six other periods of various industrial arts courses.

The most successful part of the classroom course in driver education was an individual problem approach project. About midway through the course the students were asked if they knew of any places in the community where traffic caused dangerous or potentially dangerous situations. Almost immediately every hand in class shot up. We then discussed some of these places. The next time the class met we considered the possibility of making a survey of our communities traffic problems. The project as it finally emerged from our class deliberations was for each member to select a partner. Each pair then picked a potentially dangerous place to study. They studied their area and made a diagram of it. They then proceeded to list all the possible ways of solving the traffic hazard, even those that seemed impractical because of expense or some other item. They then selected from this list the most practical means for solving the problem and made a shorter list. The fourth item on their report was a new diagram of the area with their suggested improvements included.

This project was very successful. My students took it seriously and were very enthusiastic about it. We all learned a great deal about traffic surveys, traffic management, controls, engineering, and legal problems, among other things.

The final step in our plan was to submit the papers to the chief of police and the mayor for possible action.

In Summary

In summing up the author would like to remind the reader about the following important points in the use of the problem solving approach:

1. The problem solving approach is *not* an educational panacea. It does not replace, but merely supplements, other methods of teaching.
2. Its use must be carefully planned and the situation in which it is to be used carefully selected.
3. When the student comes in contact with a seemingly insurmountable obstacle and is stymied the teacher must be willing and able to step in with advice, suggestions, and referrals to good resource material *without* either taking over the project or handing the students the answers already made.

If a teacher keeps the above points in mind, he will find this approach to his educational tasks very useful and rewarding. ◀

Hoop Skirts

The early days of manual training left a lasting array of practices which are reminiscent of the bygone era of hoop skirts, automobile dusters, and trolley cars.

Outcroppings of some of these practices, which have been handed down through the years, are still being followed in some of our present-day industrial arts woodworking shops. Quite frequently, teachers do not question the how or why of a procedure. They follow, as a matter of routine, that which they may have learned many years ago.

Now, let us take a look at a few of these old-fashioned ideas and practices:

I. The Ineffective Bench Hook

This primitive holding device made its appearance during the pioneering days of woodworking. Originally, work benches were not equipped with individual vises and the early leaders had to devise a contrivance which would help to "steady" boards while they were being processed.

Even though individual bench vises and hand screws of today will clamp boards far more securely than the old-fashioned bench hook, we still find this rudimentary device in some of the more traditional woodworking shops.

II. The Tedious Six-Step Method of Squaring

During the early days of woodworking, lumber was invariably "rough-sawn" and it was then necessary for the worker to follow the full set of *six steps in squaring a board to measurements*. There were no short cuts nor was there an easier way of doing it.

Today, however, lumber is normally surfaced (S2S) in all areas of carpentry and cabinetmaking. Only in "bulk" storage do we find boards that are "rough-sawn." Visits to modern cabinet shops and to homes that are being built will substantiate the fact that boards are nearly always surfaced to thickness before carpenters and cabinetmakers start building.

A number of woodworking instructors have been following industrial practices for a number of years, inasmuch as they have been teaching the relatively simple and modern *four-step method of squaring boards*. Others still adhere to the archaic and more difficult method of trying to teach that which was designed to meet the needs of the early woodworker.

The popular four-step method (boards that are damaged or cupped should be resurfaced to thickness before squaring to length and width) of squaring surfaced stock presents the following sequence of operations: (1) *finish better edge* (straight and square to surface); (2) *square better end* (straight and square to surface and finished edge); (3) *square other end to exact length* (straight and square to surface and finished edge); and (4) *finish other edge to exact width* (straight and square to surface).

III. Facing Blocks in Early Bench Vises

When bench vises first made their debut in the woodworking shop, they were rather crude for their jaws were rough and their occlusion poor. Protective facing blocks were needed so as to prevent damage to the boards that were being held firmly in their grip.

Today, however, the picture has changed! The faces of modern vises are smooth and they provide almost perfect occlusion. They are less likely to damage stock inasmuch as less pressure is needed to produce a firm hold. Woodworkers know that we burnish wood by rubbing one board against another. In like manner, wood facing blocks become burnished; thereby requiring additional pressure so as to compensate for the smooth slippery surface.

The disadvantages of wood facing blocks may be summed up as follows: (1) inconvenience and expense of installation; (2) frequent replacements as they become worn and damaged; (3) reduced holding capacity of the vise by approximately one and one-half inches; (4) possibility of damaging stock due to defective wood blocks, protruding screws, brads, glue, etc.; and (5) possibility of crushing wood fibers because of the additional pressure which is needed.

IV. Formal "Squaring Steps"

When woodworking first became a part of the school program, it was based upon the fallacious assumption that the formal "squaring steps" had to be mastered before anything could be built. Beginning pupils were required to spend lesson after lesson in an attempt to succeed in one of the most difficult operations in the woodworking shop.

Little did these early teachers realize that children could build a wide variety of small, attractive articles without knowing how to square a single board! Unlike his predecessors, the resourceful teacher of today presents introductory project ideas, such as: tie racks, wall shelves, benches, and bird houses which are *not* based upon formal "squaring steps." They use a wide assortment of templates and project ideas which preclude the use of square members. Even in the more advanced work of building a model boat or an airplane, the square is seldom used.

Since the process of squaring a small board to measurements is normally recognized as being difficult, should it not be introduced to the child at a later date? This will give the beginner an opportunity to acquire certain basic skills and information in the area of woodworking.

Then, after he has completed several small attractive projects, he will be far better prepared to tackle the difficult task of squaring a small piece of surfaced stock to exact length and width.

V. The Traditional Shop Coat and Apron

One look at pictures of our earliest woodworking shops will reveal the fact that shop coats and aprons were the order of the day. The instructor and all students wore them *at all times* while in class. And, indeed, this was the proper thing to do! "Protective clothing" was necessary inasmuch as many of the shops were located in the basement, adjacent to the coal-fired boilers. Overhead pipes and structural timbers accumulated heavy layers of dust. There were no exhausts. Many of the shops were dark, dingy, and dirty. At that time, the shop coat was a real necessity and it might readily be compared with automobile dusters. As we all know, these quaint costumes gave

in Woodworking Courses

PAUL N. WENGER

- **Routine practices,** which have been handed down from one teacher to another — even though the reasons for these practices are no longer valid — **are existent in today's woodworking classes,** according to the author.
- **Here is a listing of seven of these "hoopskirt" practices, cited to encourage a more modern approach to I-A woodworking.**

a measure of protection to clothes while driving over dusty roads, in open automobiles, which were in need of frequent repairs.

Today, the shop coat and the shop apron should still be worn — *but only when needed to protect clothing.* Only a thoughtless or careless person would run the risk of ruining a good suit of clothes while staining a table or painting a cupola! However, there is both a time and a place for wearing "protective clothing."

Many woodworking teachers have not required the full-time use of shop coats or aprons for a great many years. The reasons frequently given are as follows: (1) Many activities do not warrant the additional inconvenience and expense; (2) Additional clothing is hot and uncomfortable during warm weather; (3) It is difficult to provide proper maintenance and, when shop coats and aprons are torn and dirty, they impart an unkempt appearance to the class; (4) Loose-fitting garments may become snagged on bench vises and machines; and (5) Many styles are lacking in professional dignity for they do not match the smartness of clothing found in other walks of life.

VI. Woods and Designs of a Bygone Era

Following in the wake of early woodworking shops, which stressed the making of isolated joints and processes, we find the origin of a nondescript style of project designs. These self-styled articles became known as *"the typical manual training projects."* They were widely adopted in the woodworking shops of the day and left their imprints on the source material which was to follow for a great many years.

Even today, connoisseurs call our attention to the fact that "school" woods and designs tend to follow a rather odd set of ideas which vary greatly from those of top-flight manufacturers. At this point, however, we must differentiate between the superb furniture made by discriminating specialists and that which is cheap, tawdry, and shoddy. Many woodworking teachers have made a thorough evaluation of woods and designs which are to be found in expensive gift shops, novelty stores, and furniture salesrooms. They realize that it is *not the quality of workmanship* that frequently accounts for the variance that exists between distinctive professional articles and those which are sometimes made in school woodworking shops.

Specifically, many school shops provide a type of lumber which is different from that which is used professionally. For example, poplar, willow, gum, bird's eye maple, and aromatic cedar (excepting that which is concealed by veneer) is seldom used in manufacturing today's finest furniture. Discriminating manufacturers do not like to use woods that cannot be stained (or wood filled) attractively, for they are aware that it will result in the making of "mongrel" furniture — that is, items which are not in keeping with the best traditions of the field.

Then, too, good furniture normally adheres to specific period styles. The designer follows certain basic concepts which are in keeping with the best traditions of its type, such as: contemporary, colonial, Danish, Norwegian, French provincial, Spanish, Oriental, or any one of a wide variety of other styles. Professional designers are hesitant to mix style characteristics indiscriminately for there is likelihood that the resultant product will be lacking in both sales appeal and in authenticity.

Many woodworkers in our school shops are superb craftsmen and if they are influenced by modern concepts of good design and if the right kind of wood is made available, they too will produce articles that have "that professional look."

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VII. The Unattractive, So-Called "Natural Finish"

The growing pains which accompanied the manual training movement gave rise to a type of finish which became quite typical of that era. It was known as the "natural finish" for it precluded the use of stains and/or wood fillers. School woodworking classes adopted the practice of applying shellac, or varnish, or oil directly to the "raw" wood.

It is difficult to find the origin of this irregular practice for it is so unlike that which has been followed by the makers of fine furniture for many years. It may have originated because of the lack of a wide variety of prepared stains. The use of water stains and spirit stains may have been beyond the capabilities of children. Or, maybe it was because of a misconception, or possibly a lack of information, on the part of teachers.

Today, fortunately, we find a wide variety of exotic oil stains which are almost foolproof and which are easy to use even by the youngest children in the class. They include colors such as platinum, blonde, pecan, wheat, straw, champagne, driftwood, bleached mahogany, honey, and a long list of delicately-tinted traditional colors.

Specialists in the area of wood finishing realize that properly blended stains or wood fillers accentuate the graining of the wood and greatly increase its beauty. This practice is almost universally adopted for manufacturers would encounter heavy sales resistance if they turned out furniture which had a "raw" and uninteresting appearance.

The following reasons are given to substantiate the proper use of stain or wood filler: (1) it accentuates the graining because it penetrates into the porous area between the annual growth ring but cannot penetrate effectively into the hard dense ring itself; (2) it "softens" the sharp variation in color between heartwood and sapwood; thereby making them more nearly compatible; (3) it imbues the finished article with a uniformity of color even though the individual boards may vary somewhat in color and texture; and (4) it helps to produce a professional finish which will more nearly match pieces of good furniture used in the same room. ◀

Concepts of Design in I-A Teacher Education

ROBERT A. HARDIN, RALPH C. WENRICH, and WELCOME E. WRIGHT

- The importance today of **incorporating principles of design in industrial education creates a need for greater scope for the subject in the area of teacher education.**

- Here, three leading teacher educators **analyze the history and philosophy, fundamentals, method, etc., of design** in the education of industrial arts teachers.

Some time ago someone made the observation that a seventeenth-century mathematician could step into the present day college classroom and, without a change in pace, take up the teaching of mathematics as that subject is presently taught. If this is true it represents an educational paradox entirely out of phase in the world that is surely characterized by change.

Thinking in retrospect may reveal to us that more than one subject matter area may be involved in such a paradox. For instance, what would we see if we superimposed a composite picture of today's teaching methods in industrial arts teacher education over that of 50 years ago? It is highly probable that we would see so much similarity that there would be little occasion for pride in our progress.

In industrial arts design, to select one area for particular attention, we note that in the 1920's design efforts were concentrated in a course in industrial arts design in which particular emphasis on learning the rules of design was the accepted approach. Search into current methods of teaching design reveals that many industrial arts teacher educators have little more reason to pride themselves on progressiveness than teachers in other curriculum areas. Methods used in teaching design today, with few exceptions, do not deviate from the pattern set in the earliest textbooks on the teaching of design. Is there any hope that the superimposed picture of the next ten, twenty, or fifty years will be more encouraging?

Rules of design, on which we seem so dependent, are perhaps the most inhibiting factors in the learning process. Rules may contribute to learning when their true place in the educational picture is realized, but we have been building high fences of these rules and the results from students' efforts to surmount the fences have been disastrous. By the time the rules have been memorized little desire for creative design remains. Why have we hesitated so long in seeking new pathways of learning? We are presently following a trail of apathy in the belief that, when our forefathers conquered the West, the last frontier was breached. These hardy people followed the trail with courage and daring. There are far more frontiers ahead of us than the pioneers of the West ever imagined and we have but to attack the educational frontier with equal courage, daring, and perhaps abandon to insure the progress demanded in our fast moving society.

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It is with the hope of encouraging more industrial arts teacher educators to try new ways, with boldness and confidence, that the following thoughts on the teaching of industrial arts design are presented. For convenience in presentation, this material has been divided into eight sections. This has been done arbitrarily, not necessarily to indicate a desired sequence of student experiences in design.

1. Introduction to Design

An introduction to design is concerned with acquainting the student with what the designer does and how he works, a survey of the field of design, the methods used and the requirements a well-designed product must meet. If we need to reduce the definition of design to a simple sentence, we might say that design is creative planning to fulfill a need. More important than the exact wording of a design definition is a common understanding among a group of industrial arts teacher educators who plan to make a more objective approach in the teaching of design. The emergence of the concept of design is contingent on the acquisition and organization of many percepts. These percepts may be presentation of information in a pencil sketch; a knowledge of materials; tools, machines, and construction methods; and a history of design, research, and methods of design. These percepts are all involved in design and knowledge of their involvement should be introduced as early as possible, either in our course in industrial arts design or, preferably, in prerequisite shop courses. The student should also become familiar with the standards by which a design is evaluated. The following are suggested as acceptable standards:

1. Is it suited for the purpose for which it was designed?
2. Is the indicated construction sound?
3. Can it be made in the manner de-

signed, and of the material indicated in the design?

4. Will it need added decoration to make it attractive or does the material contain natural characteristics which tend to decorate?

5. Has the design been conventionalized to conform to the limitations and requirements of available material and processes?

Objectives in any educational program should be clearly obvious to all concerned. It should be understood that the attainment of the objectives is the result of the organization of many elements into a configuration, an end that is arrived at by harmonious development and not by taking each objective one by one. The following objectives are broad enough to cover most industrial arts design education:

1. To secure broad basic experiences in the fundamentals of design.
2. To acquire an understanding of materials and their characteristics, their limitations, and their application.
3. To develop creative planning and problem solving abilities and the necessary habits and attitudes which develop design ability.
4. To appreciate the value of creativity in the Industrial Arts shop.
5. To enjoy beauty and functionalism in our everyday lives.
6. To study the design of other cultures, of other periods, and of our own culture.
7. To learn the basic skills and processes necessary for designing and constructing projects of the materials with which a teacher might have his students work.
8. To learn to appreciate good design and craftsmanship in both hand made and manufactured articles.
9. To strive toward excellence in design and craftsmanship as the projects are planned and constructed.
10. To become familiar with tools, machines, and the processes applicable to the industrial arts shop.
11. To become aware of design principles and what the student can be expected to design and construct.

2. History and Philosophy of Design

Modern thinking in the realm of design may reject the thought of studying the history of design. There seems, at present, to be a concerted effort on the part of some "moderns" to prove that anything that is new is good and everything that is old is for the "diehards" and "fogies." However, it is quite clear, to the impartial observer, that much of that which today is being done under the name of abstract painting and drawing was being done 400 years ago by the Southwest American Indians and, therefore, is not as new as we may have been led to believe.

Whether or not one classes his design preferences as modern, it is certain that he has no basis for such classification unless he knows what has been done in the past. One certainly cannot determine his relative position unless he knows where he has been. How does one know that his work is new unless he has at least a cursory knowledge of the history of design?

In past ages styles in design have changed many times, and usually the changes have been improvements over that which had been done before. It is noted, however, that in the initial stages of such reformation, the results were somewhat less than the ultimate in good design. Such was the case in the early years of the so-called modern period, particularly in the design of furniture. Domestic architecture has not yet developed a truly modern style. In contrast to the nonfunctional, and at times, unpleasant designs in furniture, there is now an indication that some designers are familiar with Hepplewhite, Sheraton, Chippendale, Shaker, etc., and retain some of the elements of these designs in their morgue of ideas. One can see in some of the new furniture the lines developed by famous designers of former eras. What the modern designer is now often doing is using the well-known lines and contours of famous styles, removing the gingerbread — i.e., the carving and excess turning — and smoothing out the lines, with the result that the creations are beautiful in their simplicity and contour, and are more functional.

3. Fundamentals of Design

The terms *design* and *composition*, through constant usage, have been employed to describe the selection and arrangement of lines, forms, and color, which make up the plan of works of art and which are utilized to arouse the emotional reactions of the beholder. Design is fundamentally a matter of arrangement. Its elements are space, line, form, texture, and color, whose principles are proportion, subordination, rhythm, repetition, balance, opposition, transition, and harmony.

Design is the art of creating and arranging combinations of lines, forms, and color to produce a picture, a statue, a building, or any useful or ornamental object. Composition, derived from the Latin word *Componere*, to put together, is essentially the practice of combining the elements of design so as to result in a harmonious whole. In our teaching we have been requiring students to learn these elements one by one before attempting to produce a design, which resulted in stagnation of creativity. It has been observed that greater freedom in design permits consciousness of these elements to evolve out of design attempts and enlivens the student's creative impulses. Much progress has been noted when teachers adopt only one fixed rule in design, namely "form follows function" and let the other rules emerge as a natural consequence in the students' design efforts.

". . . Design is the art of creating and arranging combinations of lines, forms, and color to produce a picture, a statue, a building or any useful or ornamental object. . . ."

— San Jose, Calif., College

One of the most common errors we make in the teaching of design results from the assumption that one must be completely aware of the elements of design and must have studied combinations of line and space, continuity and contrast, color and harmony, etc., before attempting to design a chair, a coffee table, or a pair of cuff links. Acceptance of this assumption must also mean that, before a young child can learn to speak the English language, he must first learn to conjugate a verb, decline a noun and learn all the other rules of composition. Nothing could be farther from the truth. All of you were probably speaking reasonably correct English before you learned in school that there were such things as nouns, verbs, past tenses, and independent clauses.

An artist who has attained considerable stature in his profession once stated that all children are artists. Later on, when they have been exposed to the various restrictions which seem bound to confront them, most of them develop a sense of frustration concerning their ability to design. The new element of freedom in modern design promises a relief for this frustration. If we promote this freedom, we may note that the rules of good design will evolve naturally and freely after initial excursions in the realm of free expression.

An integrated plan for the teaching of design is needed. A "one-shot" contact with design is generally not sufficient. Design instruction would seem to be most effective in teacher education institutions where instructors, in addition to the design teacher, are interested in, concerned about, and willing to do something about the teaching of design.

4. Method of Design

The old saying, "there is nothing new under the sun," may apply nowhere better than in the field of design. It is safe to say that no product or work of art today is completely new or original. To say that a design is all new would be about as sound as expecting a South Sea Islander to design a room of furniture for the modern American home. It is true that the approach and organization may differ from that which has been done before, but the design is the end product of past experiences, knowledge of materials, processes and reactions or psychologies of people, plus the ability to organize these elements into the desired unity.

Those who work in industrial arts design must guide their approach by the characteristics of the school shop and other conditions peculiar to their work, but we can well take a cue from the industrial designer. When the industrial designer undertakes the job of designing or redesigning a product, a great deal of research must be done before a design of the article emerges. He must, first of all, find out just what his client and his client's prospective customers want. He must have an intimate knowledge of the physical and mental attributes of those who are going to use the end product. He must have a working knowledge of engineering economics, because the designer often finds it desirable and necessary to spend some time in the plant where the product is to be manufactured, studying their machines and manufacturing layout. He must be thoroughly familiar with the materials of industry and how people react to different materials. The designer must also have an extensive library of design ideas.

If one of the goals in industrial arts design is for students to develop a degree of originality, the student must have available a library of ideas out of which he can evolve his design; he must know what has been done before. He must know something about the materials, machines, and processes that are characteristic of the school shop. It seems inevitable, then, that an element of research must enter into our teaching of industrial arts design. The following seem to be logical steps in design method:

1. A need exists. This need or problem is analyzed and studied in terms of its function.
2. Hypotheses are presented. This step consists of making many sketches of possible solutions for the design problem.
3. Information is gathered. This consists of collecting data regarding required measurements, consulting magazines and other printed materials in order to get ideas from similar design problems, looking up references, talking with qualified persons, experimenting with mock-ups, etc.
4. This material is synthesized. This involves the working over of the best sketches, working in the information and data collected earlier, refining the rough sketches into more accurate drawings, determining actual materials and dimensions, and making experimental models, finally coming up with a workable design.
5. The design is evaluated. This involves a re-working to get rid of any remaining defects in the design, and then putting it into the form of final working drawings.

5. Influence of Materials on Design

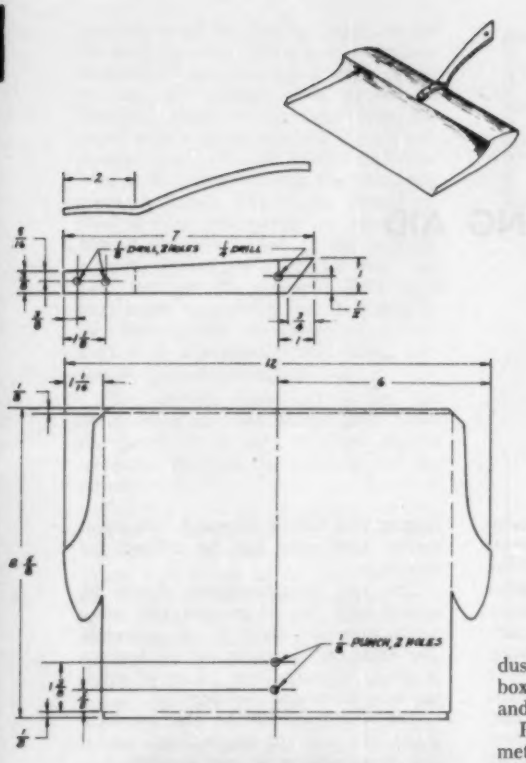
It seems educationally unsound to expect that students should become proficient in design if their only exposure to this means of communication has been a two-hour course in industrial arts design. It seems more logical to begin design experiences with the first project constructed in their beginning course in the shop, and continue these experiences in all subsequent courses. Design, so taught, must go far beyond selecting a good drawing from a book and making the project. Since a good design depends not only on skillful execution with a pencil but also on a familiarity with materials, an intimate knowledge of the characteristics of materials is necessary before the *industrial* designer can begin his work. He must know what materials are to be used in making the product and just how these materials will affect his design. He must use the best material available at a cost which will give satisfaction to the consumer and a profit to the manufacturer. Each material used in manufacturing articles is usually used because it is either better or cheaper than other materials. Often a material is used because it is better adapted to the manufacturing process than any other material. There is much we can learn from the practices of the industrial designer.

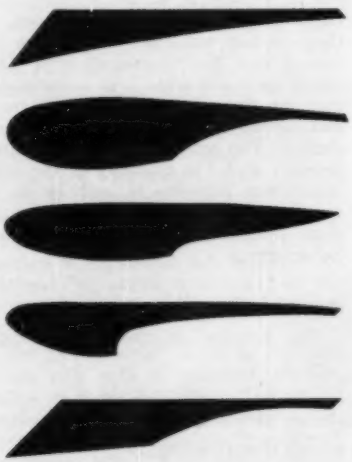
Many articles are made of wood because the physical characteristics of wood particularly adapt the material to its intended use. Many of the same articles, such as pieces with bent or laminated members, cannot be readily made of wood in the school shop, due to a lack of fabricating equipment, so the designs must necessarily call for metal or be revised. Usually no material should be made to imitate another. Wood articles should be designed and finished to look like wood, metal to look like metal, and other materials should look like neither but should make an appeal through their own beauty. The characteristics of the finished project and its function should determine the kind of material to be used, and the material usually should not be modified to fit the design. There should be no dishonesty in industrial arts design.

6. Influence of Structure on Design

Industrial Arts teacher educators interested in developing a more effective approach to the teaching of design may do so from the artist-craftsman viewpoint to which industrial arts is particularly adapted. An example of this is the "functional-structural approach" which is used in a number of teacher education institutions. This approach is based on current professional design practice and is applied specifically to design as it relates to industrial arts. It is an approach to the designing of the three-dimensional objects with physical functions as a primary consideration. The words *functional* and *structural* simply indicate the major emphasis in the designing and in the evaluation of the resultant designs. The functional part of the approach is con-

(Concluded on page 44)





DESIGN for the TEACHER

Another of the series of articles on **how to apply design to various instructional areas —**

john r. lindbeck

Associate Professor of Industrial Education, Western Michigan University, Kalamazoo, Mich.

Sheet-Metal Design

Perhaps one of the reasons such a problematic situation exists with respect to projects for the sheet-metal class has to do with the nature of the sheet-metal trade itself: the majority of the tasks revolve around such things as heating ductwork, gutters and downspouts, metal containers of various kinds, ventilators, and the like. The teacher who places emphasis on the trade aspect will frequently, as a result, have his students engage in such activities, with an occasional funnel or tote-box thrown in. Such are the consequences of emphasizing the sheet-metal hand skills and pattern development techniques, to the detriment of the project design. The situation can change if the attention would be turned to a practical consideration of the types of products which are forthcoming from the sheet-metal industry. Products such as dustpans, mailboxes, planters, canisters, wastebaskets, and watering cans are typical of them.

Preliminary to designing for sheet metal should come a discussion of new advancements in the field: contact adhesives; new solders and fluxes; new rivets, such as the explosive and mechanical types; new joints and joining methods; and new materials. This information, coupled with the consideration of the nature of sheetmetal products, serves to set the stage for student design activities.

Dustpan Design

The task involving the design of dustpans is very challenging in that the problem is one of designing something not stereotyped, but truly unique and creative. The thinking should be directed toward producing a functional, easy to store, easy to clean, serviceable, good-looking dustpan. The problem analysis can be made somewhat simpler and more stimulating by studying and evaluating a few dustpans which have been purchased or previously made in class. Look at the good points and the bad and discuss how they can be modified or improved through redesign. Are they heavy or clumsy to use? Investigate the use of aluminum, or reconsider the amount of material necessary in its construction; this may suggest new shapes and dimensions. The average broom is about ten in. wide, so this evidence establishes the required width. Most pans are too deep and too high, so trim them down. Study some possible contours, such as those illustrated. Sketch some of the proposed improvements and modifications; develop a full-size cardboard layout and assemble it for further study and criticism. Think about some functional handle arrangements and try them out on the model; strive for clean, graceful lines and sensitive contours in the final design. There is no reason on earth why a dustpan cannot be a utensil which is easy to use and a joy to look at.

And all the while the designing is taking place, there must be skills taught and knowledge of materials and processes imparted. The designer must be thinking of the joining methods, the materials, or possible finishes. Designing for sheet metal, as with any other medium, involves functional, material, and visual considerations.

One way to get the beginning student involved in sheetmetal design is for the teacher to prepare a sheet of suggested profiles, such as those illustrated; require that he select one of the profiles and use it as a point of departure in designing a dustpan. Help him to analyze and experiment. When his ideas have crystallized, have him prepare the drawings and a plan of procedure necessary to complete the project, similar to those shown here.

Plan of Procedure

1. Select a piece of 26 gauge tinplate, 8⅝″ x 12″.
2. Lay out the pattern on tinplate.
3. Cut out pan from sheet metal; punch holes and remove all burrs.
4. Bend hems first, then sides.
5. Roll hood up by hand; clamp in place and solder.
6. Clean the pan with lacquer thinner and finish the piece with flat black lacquer or paint.
7. Select piece of ⅛″ x 1″ x 7″ aluminum bar stock.
8. Lay out the handle pattern on the aluminum.
9. Cut out handle from aluminum and drill holes; remove all burrs.
10. Clean the handle with lacquer thinner and finish with clear lacquer.
11. Fasten handle to pan with aluminum rivets. ◀

A MAGNETISM TEACHING AID

HENRY ZEIEN
Long Beach, Calif.

Students beginning their study of electricity and magnetism will master the fundamentals much quicker if they are shown what actually happens under various circumstances.

Six volts from four flashlight batteries are used to demonstrate a current carrying conductor being repelled in a magnetic field. With the aid of two small electromagnets this same source of current is utilized to show how like poles repel and unlike poles attract each other. To show mutual induction between two coils, solenoid action, and the effect of a core in a choke coil or in a transformer, 110-volt alternating current is used. The required items to display these phenomena can easily be constructed in the school shop.

The next thing that students should be shown is how current is induced in a coil when it is cut by magnetic lines of force. To demonstrate this a rather sensitive galvanometer is required. One that measures current in milliamperes will serve the purpose.

A vertical panel is required to mount the equipment for demonstration purposes. This could be an ordinary masonite board with a frame and provisions for holding it in an upright position. The attached drawing shows another way of solving the housing problem. This arrangement contains a compartment in the bottom to carry the required items, the batteries, tools, a compass, leads, and other paraphernalia that might be used from time to time.

If not already available in the shop, a milliampere galvanometer, a small horseshoe magnet, four flashlight batteries, a doorbell switch, and a six-volt bulb and socket should be purchased.

From materials available in most shops two air-core coils, two electromagnets, a solenoid, a soft iron core, and leads with alligator clips can be made. These items might well be assigned to students as individual projects for construction.

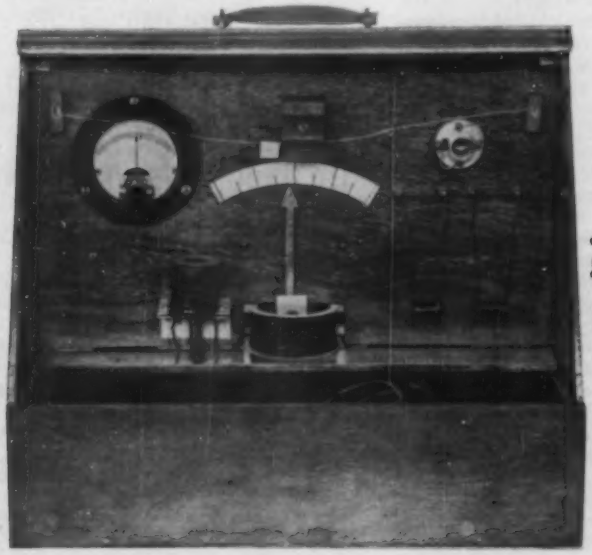
The air-core coils can be wound on a cardboard or fiber tube about 2 in. in diameter and 1 in. in length with ⅛ in. masonite used for the ends. The number of turns is not too critical in this case. Several hundred turns of No. 22 magnet wire will be adequate. Two small screws with nuts can be utilized for terminals.

The two electromagnets should be wound with No. 32 magnet wire on a ¼ in. iron core about ¾ in. in length. The ends can be made out of formica or fiber. Approximately ⅛ in. of winding is sufficient for this purpose.

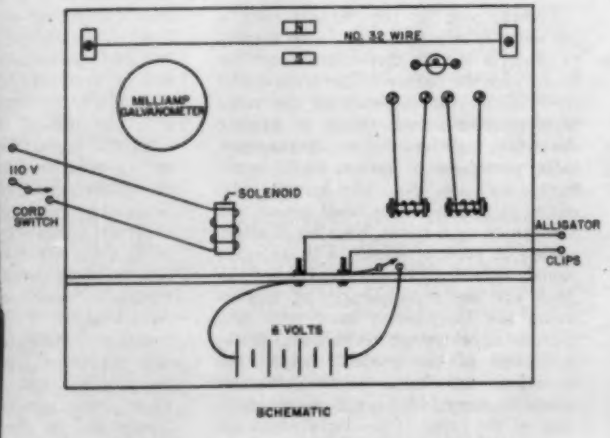
The solenoid must be able to withstand 110 volts of alternating current. For this purpose an old washing machine solenoid is just fine. If one of these is not available, it can also be wound with No. 32 magnet wire. This should be constructed with a removable core so that choke coil, transformer, and solenoid action can be demonstrated. The amount of wire required depends upon the diameter of the core. Somewhere between ¼ and ⅜ in. of winding should be sufficient. If insufficient wire is used, excessive heat will be generated.

Assembly Procedure

The location of the various com-



A view of the exterior of the teaching aid (left) and the wiring diagram (below).



SCHEMATIC

ponents upon the display panel can be decided by the individual instructor. Somewhere near the top a single strand of No. 32 magnet wire should be mounted about ½ in. away from the panel with a screw terminal at each end. A small block of wood placed under the wire at each end will keep the wire away from the panel. The screws should extend through the panel far enough to permit the attachment of the alligator clips on the reverse side. This wire must pass through the magnetic field of a permanent magnet because it is used to demonstrate the movement of a conductor in a magnetic field when current is passed through it.

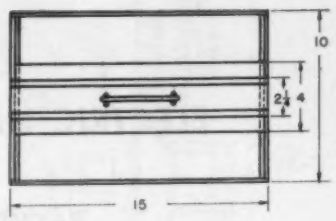
The six-volt bulb and socket are mounted at any convenient place upon the panel. It is used to show mutual induction between the solenoid and the air-core coil.

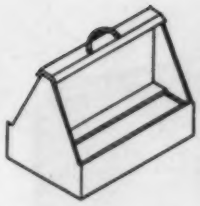
The two small electromagnets are suspended by the continuation of their own windings from four screws 1½ in. in length with about ¼ in. space between the magnets. The mounting screws serve as terminals for the connection of alligator clips on the back side. These electromagnets must swing clear of the panel. Three nuts are used on each screw. One nut is used to fasten the wire from the magnet against the head of the screw, and the other two are located one on each side of the panel. A small block of wood or some other spacer could also serve to provide clearance. In attaching the solenoid a bracket should be used, so that it will be about one inch away from the panel. This will permit placing an air core coil over it to demonstrate transformer action. A service cord with a cord switch inserted should be connected to the solenoid. The batteries are installed in series in the lower compartment. A doorbell switch inserted in the circuit will facilitate operation. This switch is mounted on the horizontal crosspiece behind the display panel.

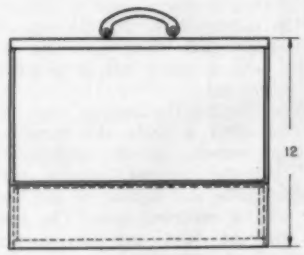
The galvanometer should be mounted to one side with an air core coil connected to it by 2-ft. leads. The photograph also shows a homemade galvanometer, but it is difficult to construct one that is sensitive enough to register the small amount of current that is induced when a magnet is inserted into a coil. For this reason it is recommended that one be purchased to demonstrate this induction.

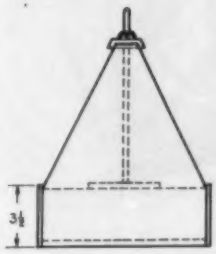
The doors shown are optional, but they do make the kit look neater if it is carried outside of the classroom. These doors are installed without hinges, so that they can be completely removed when the demonstrator is being used.

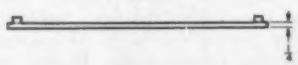
The switches and terminals are all located on the reverse side of the display panel. The reason for this is to permit the instructor to operate the aid from the back side, so that he will not obstruct the view of the class. Operation will also be facilitated if half of each circuit is permanently wired, and the other half completed with the alligator clip leads.

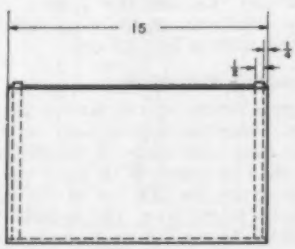


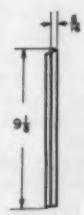












Bill of Materials

Quan.	*Part*	*Material*	*Size*
2	Doors	Mahogany plywood	¼ x 9 x 15"
2	Sides	Mahogany plywood	¼ x 3½ x 15"
2	Ends	Mahogany plywood	¼ x 9½ x 11½"
2	Supports	Mahogany plywood	¼ x 3 x 9½"
1	Crosspiece	Mahogany plywood	¾ x 4 x 14½"
1	Display panel	Mahogany plywood	¼ x 8 x 14⅝"
1	Bottom	Fir plywood	⅜ x 9½ x 14½"

Quan.	*Part*	*Material*	*Size*
1	Top	Mahogany	¾ x 2¼ x 15"
4	Door cleats		5/16 x ½ x 9"
1	Handle		
1	Galvanometer		Milliampere
1	Magnet		25 pound pull
8	Alligator clips		
4	Flashlight batteries		
1	Doorbell switch		
1	Cord switch		
1	Cord with plug		
1	Bulb with socket		6 volt
200 ft.	Magnet wire		No. 22
600 ft.	Magnet wire		No. 32
24	Screws and nuts		Various sizes
4	Test leads		3 feet

ELECTRIC HAND LANTERN

RAYMOND CASEY
Instructor of Industrial Arts
Woodrow Wilson Junior High School, San Jose, Calif.

The electric hand lantern is a practical project with good student appeal. It is a useful item for outdoor recreation and motor trips and is a handy light around the home. While it is a popular unit in our electric shop classes, the lantern is also a suitable project for the metal or general shop.

Fundamental electrical learning includes: (1) drawing the electrical circuit using the correct electrical symbols; (2) understanding the function of the circuit parts; (3) how the dry cell produces electric current; (4) methods of connecting dry cells; (5) how electric lamps and sealed beams operate; (6) the meaning of current, voltage, and resistance.

Procedure for Cutting

Begin construction by calculating the amount of metal required for the complete lantern and determine how it should be cut from the stock sheet without waste. All of the cutting is done on the squaring shears. Good accuracy should be maintained in cutting the separate pieces.

The layout of the various pieces for cutting, drilling, and bending is next. Use a sharp scratch awl, a combination square, and a metal rule for this work. After the layout work is completed do the indicated cutting, notching, and drilling for each piece.

For the switch slot hole drill two ¼-in. holes side by side. Cut the remaining metal out with a small cold chisel and file the slot to shape with a small square file.

The center of the sealed beam hole in the front panel is now located and the circle scribed with a pair of dividers. Clamp the stock to a board and drill a ½-in. hole through the center of the front panel. With a pair of aircraft type snips slowly cut the hole for the sealed beam. Remove any burrs or rough edges left by cutting with a half round file.

All of the bending is done on a finger brake as indicated on the drawing. It is important that each piece be accurately bent so that it will fit properly when assembled.

Before bending the lantern base, file or scrape with a knife the metal at the four corners on the underneath side. Coat the cleaned surfaces with soldering paste and lightly tin the surfaces with a soldering iron. The base may then be bent and the corners soldered firmly together.

One end of the wire carrying handle is bent first. The rubber tubing is then slipped over the straight portion and the other end is completed according to the drawing. This bending is done in a vise.

The negative copper contact plate is next fastened to the fiber insulating plate by passing the ¼-in. tab on each end of the copper plate through the ¼-in. hole in the fiber and bending the tab under. Place this assembly on top of the second fiber and transfer the complete assembly to the right hand side of the battery housing from the open end. Locate the holes in the battery housing through the fiber with a scratch awl. Remove the contact assembly. Center punch the metal lightly and drill with a No. 43 drill.

Preassembly Procedure

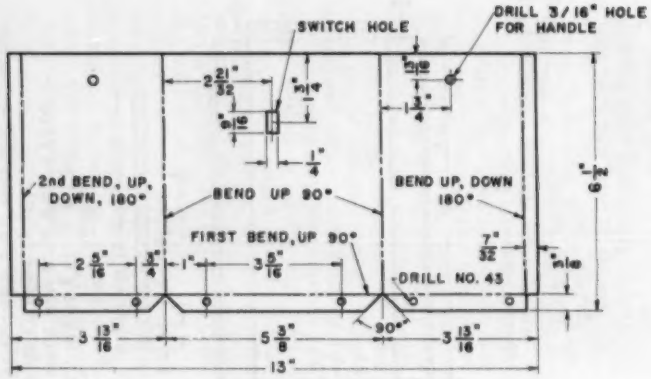
A preassembly of the lantern parts is next. Place the lantern body on the lantern base and space it equidistant from the four edges. With small metal clamps secure the side lips of the lantern body to the base. The underneath side of the base will have to be backed up with a ⅜-in. block so that the clamps will grip evenly. Set the clamps so that they do not cover both holes in the lip. With a combination square check both corners of the lantern body for squareness. Place the front panel on the front of the lantern body and check it for fit. Do the same with the lantern top. With a scratch awl scribe the lantern base through the holes in the lips of the lantern body. Remove the clamps and lantern body from the base. Lightly center punch the indicated holes in the base and drill with a No. 33 drill. Replace the lantern body on the base and fasten it securely with the self-tapping screws from the underside. Fasten the contact assembly to the side of the battery housing with the self-tapping screws. Position the battery housing in the bottom of the lantern case. Hold the unit in place and mark the case through the holes in the battery housing with a scratch awl. Remove the battery housing and lightly center punch the indicated holes. Drill the holes with a No. 33 drill. Replace the battery housing and secure it to the lantern case with the self-tapping screws from the outside.

Place the top on the lantern body. Hold it in position and drill the six holes for the self-tapping screws. Use a No. 43 drill. Fasten the top in place with the screws. Place the front panel on the lantern with the top edge underneath the lip of the lantern top. Drill the hinge holes in the lantern body on each side through the hole in the lip of the lantern front panel. Use a No. 43 drill.

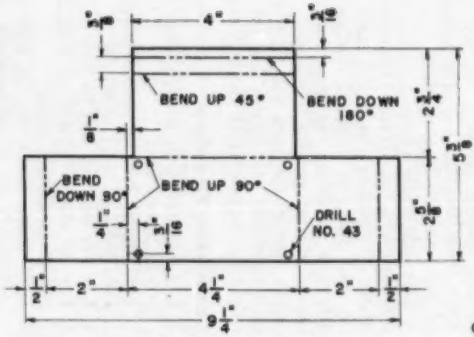
Place the slide switch in the switch slot of the lantern body from the inside. Have the handle of the switch at the bottom of the switch slot when the switch is in the off position. With a scratch awl mark the lantern body through the holes in the switch plate. Remove the switch, lightly center punch the marks and drill with a No. 33 drill (remembering clearance for ¼ in. by 5/16 in. machine screws).

Remove the lantern top. Hold the lantern front panel snug against the front of the lantern body. With a scratch awl mark the lantern base through the single hole in the lantern front panel bottom lip. Center punch and drill this hole No. 33 after the parts are removed for painting.

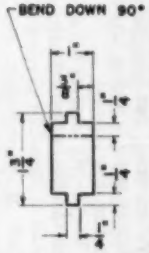
Place the lantern on the bench with the front panel facing up. Insert the sealed beam in the circular opening of the front panel. Place the aluminum sealed beam retainer ring over the sealed beam and position it so that a fastening hole is next to the lantern edge on each side. Mark the front panel through the holes in the retainer ring next to the lantern edge on each side. Remove the retainer ring and sealed beam. Lightly center punch the holes in the front panel and drill with a No. 43 drill. Replace the retainer ring and secure it to the front panel with the self-tapping screws. Carefully drill the remaining holes in the front panel through the holes in the retainer ring. Complete the fastening with the self-



LANTERN BODY

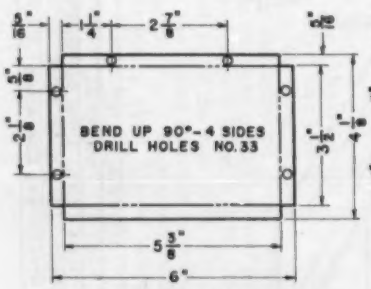


BATTERY HOUSING

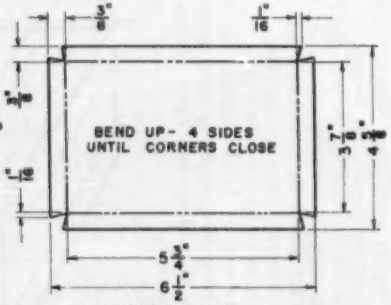


MATERIAL AND PARTS

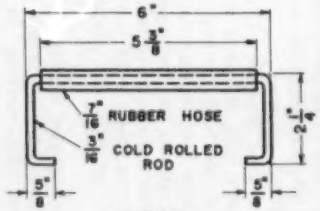
22 GAUGE BLACK IRON.
20 GAUGE ALUMINUM.
3/16" COLD ROLLED ROD.
7/16" RUBBER HOSE.
SEALED BEAM G.E. NO. 4546.
SPST SLIDE SWITCH.
LANTERN BATTERY, 6 VOLT.
SHEET METAL SCREWS, TYPE "A" 4-1/4" PARKER KALON.
B.H. PLASTIC COVERED HOOK-UP WIRE, FLEXIBLE.
20 GAUGE FIBRE SHEET.
.015" THICK SHEET COPPER.



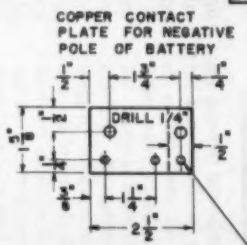
LANTERN TOP

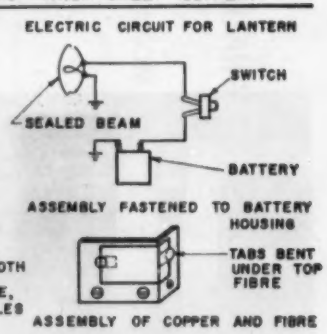


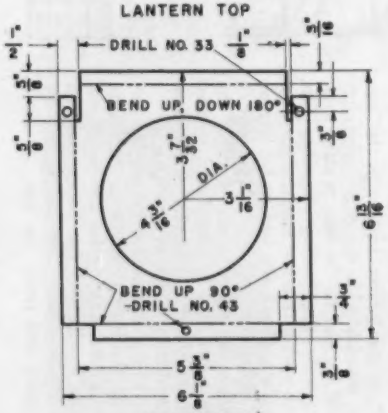
LANTERN BASE



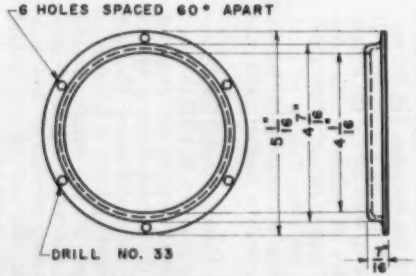
HANDLE


COPPER CONTACT PLATE FOR NEGATIVE POLE OF BATTERY
DRILL 1/4"
DRILL NO. 33 HOLES IN BOTH
FIBRE INSULATING PLATE, MAKE 2. DRILL 1/4" HOLES IN ONE ONLY.

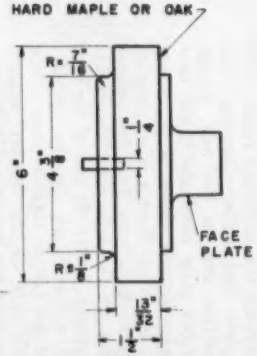




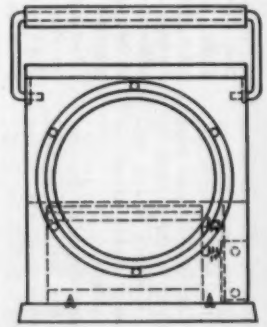
FRONT PANEL



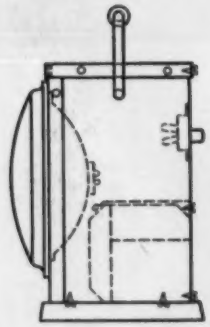
SEALED BEAM RETAINER RING SPUN FROM 20 GAUGE ALUMINUM



DETAIL OF SPINNING CHUCK



LANTERN ASSEMBLY



ELECTRIC HAND LANTERN

CONSTRUCTION DETAILS

SCALE: 1/2" = 1"

R. CASEY 8-26-57

tapping screws. This completes the pre-assembly of the lantern parts. The lantern should now be completely disassembled preparatory to painting.

Finishing Procedure

A protective finish of either lacquer or enamel may now be applied to the lantern parts. The materials may be either brushed or sprayed. The author prefers spraying if equipment is available. Before spraying with lacquer the various parts should be thoroughly cleaned by sponging them off with a cloth saturated in lacquer thinner. A good lacquer primer should be sprayed on all parts inside and outside. When the primer is dry the parts may be rubbed down on the outside with No. 2/0 steel wool. The final lacquer coat may now be sprayed to the outside of the lantern parts. A choice of red, yellow, or green lacquer makes attractive finishes for the lantern.

After the lacquer finish is dry, reassemble the lantern parts as outlined in the pre-assembly instructions. Before the battery housing is installed it should be wired as follows: Drill a No. 26 hole through the assembled copper contact plate and battery housing near the bottom and to the rear. Scrape the copper plate clean and bright near the hole. Remove about ¼ in. of the plastic insulation from a 6 in. piece of flexible hook-up wire. Pass the cleaned end through the hole until the insulation appears. Solder the end of the wire to the copper plate. On the opposite side of the copper contact plate scrape a small area of the battery housing clean toward the top edge. Tin the area and solder the end of a 5 in. piece of flexible hook-up wire. Scrape the battery housing clean of primer on the same side of the copper contact plate, above it, and to the rear. This is to make sure that the plus contact of the battery can make positive contact with the case.

Place the battery housing in the lantern case and secure it with the self-tapping screws. Connect the grounded lead from the battery housing to one terminal of the sealed beam. The lead from the copper contact is soldered to one terminal of the switch. Finally solder one end of a 6½ in. flexible wire to the other terminal of the switch and connect the end to the second contact of the sealed beam.

Place the lantern battery in the battery housing with the plus spring terminal up and to the rear making contact with the battery housing. The minus spring terminal contacts the copper plate. Check the lantern by turning the switch on and off. If the switch controls the sealed beam properly the front panel may be closed and secured with the single self-tapping screw from the underneath side of the base.

Complete the lantern by placing one end of the lantern handle in the 5/16 in. hole in one side. Spring the other end of the handle into the 5/16 in. hole on the opposite side. The lantern is now complete and ready for use.

TRY FREEZER TRAYS

JOHN H. ADAMS
Instructor in Cold Metals
Ohio University, Athens

Fudge pans, funnels and scoops are fine. They teach the mechanics and the skills, and they're all good places to start. But with all those fudge pans, funnels and scoops piled around the showcase, let's encourage the students to be original once in a while! Original projects make excellent centers for displays and spark other students to think up ideas of their own. Let's encourage them to make something they can't buy, something that isn't on the market, and something that will arouse the inventive spirit in them.

Here's a good example of such a project that's both utilitarian and not available at the local hardware store.

If you have had the unfortunate experience of opening the freezer compartment of your refrigerator to be greeted by a landslide of ice cube trays, this project will be especially appealing to you.

Many refrigerator models are made with no space provided in the freezer compartment for stacking ice cube trays. Further, the trays can't be piled on top of each other without spilling out the unfrozen water because of the lever which sticks up on top. Since no such rack is available in stores, this project would be a welcome gift for any housewife who has no place in her refrigerator for ice cube trays.

As well as being original, the construction of a simple ice cube tray rack is a good basic sheet metal project. It involves many fundamental operations in sheet metal including layout, cutting, bending and riveting.

The project involves the use of aluminum pattern sheet — a material which serves a threefold purpose: it is rustproof, it is attractive, and its raised surface pattern prevents the ice cube trays from sticking to it. The supports, or legs, are also of aluminum.

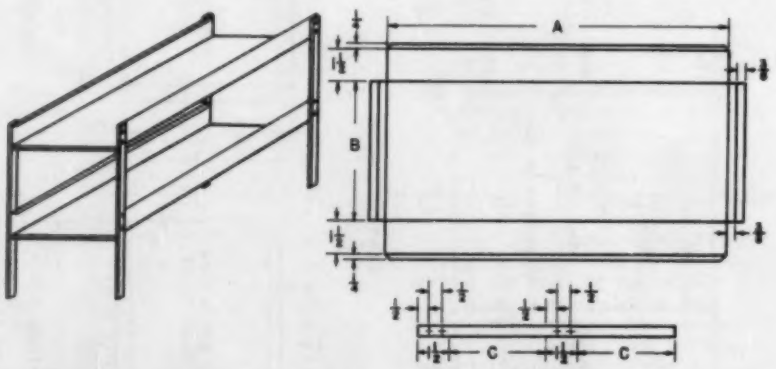
This lightweight compact unit is simply placed in the freezer compartment of the refrigerator. As it will stand on its own feet, no bolting, riveting or otherwise disturbing the inner construction of the refrigerator is necessary.

The size of the rack will vary with each individual refrigerator and the ice cube trays supplied with the appliance.[1]

Construction Procedure

1. Lay out aluminum pattern sheet and cut to layout lines.
2. Fold double hem on ends of trays.
3. Fold sides of trays to 90 deg.
4. Lay out and cut legs to length.
5. File all sharp corners on both legs and trays slightly round.
6. Drill holes for rivets in legs and countersink to fit countersunk rivets.
7. Drill or punch rivet holes in trays.
8. Clean up all parts with steel wool or abrasive cloth.
9. Assemble project.

[1]This particular tray rack was made for a Hotpoint refrigerator.



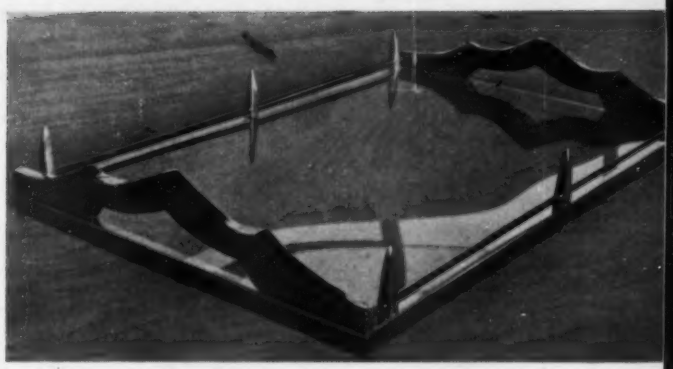
MATERIALS LIST		
NO.	PART	MATERIAL
2	TRAYS	20 GA. ALUM. PAT. SHEET
4	LEGS	1"x1" ALUM. RECT.
16	RIVETS	1/8"x1/4" CSK. ALUM.

NOTES
ALL HOLES 1/8" DRILL & CSK.
DOUBLE HEM EDGE "B" BOTH ENDS.
CHAMFER ENDS OF LEGS.
DIMENSIONS "A", "B" & "C" VARY ACCORDING TO SIZE OF TRAYS.

IDEAS IN ALUMINUM

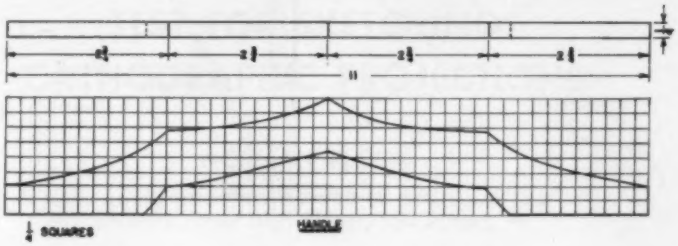
ELMER B. MATTSON

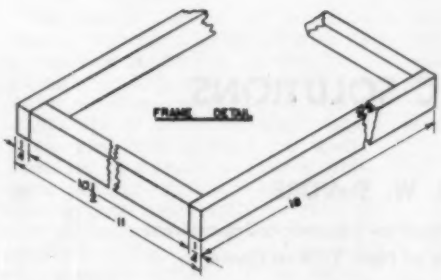
Metals Instructor, San Carlos, Calif., High School

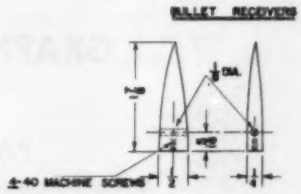


Creating with aluminum 2024 (24ST) is a pleasing and challenging experience. The metal, which possesses many features, offers much to the I-A program. It is available in many sizes and thicknesses, it is easily formed and shaped with simple tools. The buffing operation is a simple task and the brilliant finish doesn't tarnish like other metals.

Aluminum Serving Tray







This serving tray is basically a simple project, but it requires many hours of hard buffing.

Develop the design of the handles as indicated in the drawing. Using the metal band saw, cut the project to proper shape. The arcs can be formed either by a file or using the end of a six in. belt sander in the horizontal position.

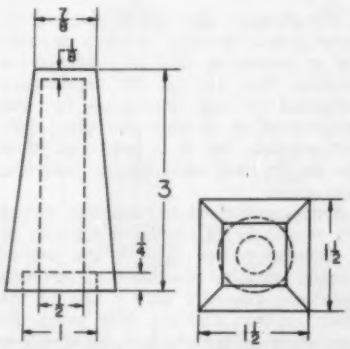
The bullet receivers are best made by using a long piece of aluminum (12 to 15 in.) stock and forming the tapering points on both ends. Band saw the tapering points and file to a smooth finish. Next, buff the bullet receivers while the stock is of long length. Then drill the ⅛ in. hole to receive the rail. Repeat this operation until six receivers have been completed.

The tray frame is cut to proper size as shown in the illustration. The basic size of the frame is 11 by 18. Assemble the frame by using 4-40 machine screws. Thus tap and thread each 10½ in. end piece. Countersink the two side pieces to make a flat fit for the machine screws. Make sure the tray is square. Next, tap and thread each bullet receiver base with 4-40 series.

Assemble the tray to check for proper fit. After minor adjustments have been made and the tray frame is of proper shape, cut the ⅛ in. plastic bottom piece. It's best to drill both the plastic and the frame at the same time to make sure the proper alignment of holes, thus use a clamping device to hold plastic and frame together during this drilling operation. Remembering the bullet receiver is already tap, thus a larger hole is needed for the plastic-frame holes, such as the No. 32. The spacing of the bullet receivers is done by the individual, remembering to measure carefully at all times.

Once the tray has been completed, take the tray apart and start the buffing operation on each piece. If black emery compound is used on a hard muslin wheel this operation is fairly simple. The buffing wheel should be 1 to 1½ in. in thickness. The final buffing is done with a soft wheel and the use of white compound on 2024 aluminum. ◀

Salt and Pepper Set

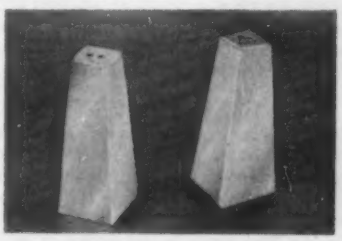


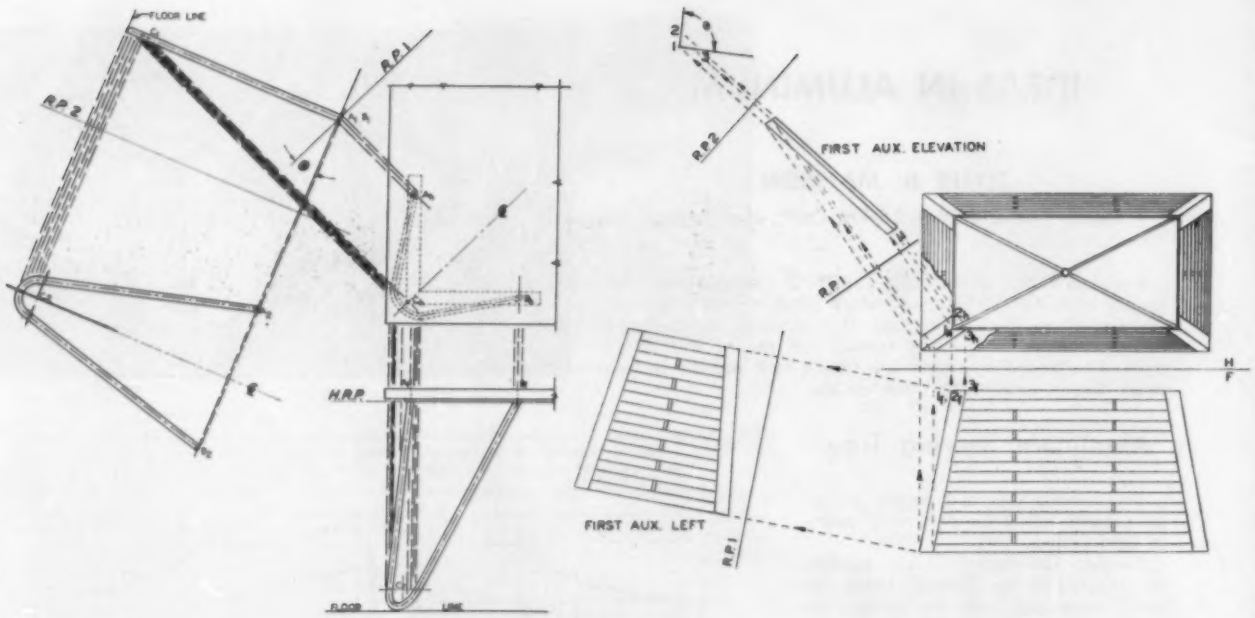
Scraps are a common thing in shop work and sometimes can be put to good use. Here is a typical scrap piece that turns into a useful salt and pepper set. The metal needed is 1½ by 3 in.

Develop the design of the set as indicated in the drawing, or design the set to fit the scrap piece that is available. Band saw the project into proper shape. Tapering the edges can be done by filing or using the 6 in. electric belt sander.

The channel for the salt and pepper is drilled with a ½ in. metal drill within ⅛ in. of the top. Measure carefully during this operation. Next, decide upon the top holes and their correct positions. Drill these holes with a No. 36 metal drill to hit the main ½ in. hole.

The buffing operation becomes a simple process if black emery is used on the buffing wheel. A good buffing wheel is at least 1 to 1½ in. in thickness. This wheel should be a hard wheel of muslin. The final buffing can be done with a loose buffing wheel using white compound for the 2024 aluminum. ◀





GRAPHIC SOLUTIONS

PAUL W. DeVORE

Acting Director, Industrial Education Department
State University of New York at Oswego

The planning approach to teaching industrial arts drawing is often rewarding in presenting unique problems for solution. Not only is the opportunity presented to the instructor for the teaching of an abstract and often difficult solution, but it is presented when the student will most benefit from the instruction.

When normal views (true size views) are taught as an unrelated segment of a drawing course through the use of already prepared workbook or textbook problems, generally only a few of the more capable students fully grasp the usefulness of the method. However, in group planning a practical problem calls for a solution and the instructor can achieve greater understanding of the use of graphic solutions in practical drawing problems.

The following practical problems have been solved in an industrial arts planning laboratory through the use of normal views. The first problem is that of a lamp shade for which the angle of bend for the brass corner pieces is not known and needs to be found in order to properly specify the angle on the drawing.

The second problem presents an interesting application of the normal view. Rather than having the complete principal views from which to work as in the first problem, we have only certain known specifications given. Therefore, we find that a normal view is necessary to properly design the hairpin leg for the table and to find the true projection of the leg in the front and top views. This layout is also constructed full size to determine accurate specifications for the length of material needed to construct the leg and the grind angle for the top of the leg for welding to the support bracket.

The following description provides an explanation of the solution to the two problems.

Problem I. Lamp Shade

Given: The design drawing of the lamp shade showing top and front views.

Procedure:

1. Lay out top and front views full size or utilize the full size design drawing.
2. Locate R.P. 1 (Reference Plane 1) parallel to corner bracket in top view. Locate R.P. 1 at any convenient distance.
3. Locate H-F (Horizontal-Frontal) reference plane between top and front views.
4. Project points 1_b, 2_b, and 3_b (the upper points of the corner bracket) perpendicular to R.P. 1. Project the lower points (not numbered) in the same manner from the top view.
5. Transfer height measurements from the front view to the first auxiliary view. Measure from H-F to points 1_f, 2_f, and 3_f. (In this problem these measurements are equal.) Transfer measurement 1_f, 2_f, and 3_f to R.P. 1 and locate points on the projectors of points 1_b, 2_b, and 3_b previously obtained in step 4.
6. Transfer the bottom points of the bracket in the same manner.
7. Connect points in first auxiliary view. This gives a true length view of the bracket.
8. Construct R.P. 2 perpendicular to the true length view of the corner bracket. Locate at any convenient distance from true length view.
9. Project from first auxiliary view points 1, 2, and 3.
10. Transfer measurements from top view to projectors on R.P. 2. Obtain measurements by measuring from R.P. 1 to points 1_b, 2_b, and 3_b in top view.
11. Connect points 1, 2, and 3 in R.P. 2. Measure the angle. This is the true dihedral angle and the bend angle for the corner brackets.

Problem II. Table Leg

Given: Material ½ in. H.R.S. table top to be 17 in. from floor. Angle of leg to horizontal 23 degrees.

Procedure:

1. Lay out full size from specifications the measurement from the floor line to the top of the table.
2. Construct partial top view of table showing support bracket for leg. (This can be estimated at this time and changed later.) The location of the support bracket helps to simplify this discussion.
3. Locate the center line of the leg (designated ℄ in top view).
4. Establish center of top of each leg segment. $A_3 - B_3$ (This is determined by the designer and his selection of the spread of the top of the leg. This can be changed after the true size view is determined.)
5. Construct R.P. 1 parallel to ℄ of leg. (Designated ℄ in top view.)
6. Project points $A_3 - B_3$ perpendicular to R.P. 1.
7. Transfer height measurements of leg from front view to R.P. 1. Measure from H.R.P. (Horizontal Reference Plane) to floor line.
8. Establish center line of leg on R.P. 1. This is determined from specifications of the angle of the leg to the horizontal plane.
9. Complete true edge view of leg. Leg is ½ in. diameter from specifications.
10. Establish R.P. 2 parallel to edge view of leg.
11. Project top center of leg ($A_1 - B_1$) to R.P. 2 and bottom of leg at floor line to R.P. 2.
12. Establish center line of leg (designated ℄ on R.P. 2) parallel to R.P. 2.
13. Transfer measurements R.P. $1 - A_3$ and R.P. $1 - B_3$ to R.P. 2 as R.P. $2 - A_2$ and R.P. $2 - B_2$. This locates the top points $A_2 - B_2$ of the leg in the true size view.
14. Determine the radius desired for the bottom portion of the leg and draw in center line of radius.
15. Determine tangent points of center lines of leg segments and radius center line.
16. Complete true size view of leg using ½ in. diameter from specifications given.
17. Using cutting planes transfer radius of bottom portion of leg to edge view, from edge view to top view and from top view to front view. (If the center line of the leg is transfered rather than the outline of the leg the process involves fewer points.)

This method provides:

1. The true size view which the length of material can be determined.
2. The true size view from which design changes can be initiated.
3. The grind angle for the top of each leg segment (shown in edge view).
4. The necessary projections and measurements to determine the correct top and front views of the oblique leg. ◀

TEST FOR SKETCHING ORTHOGRAPHIC PROJECTIONS

NORMAN PLEZIA

Instructor of Industrial Arts

Williamsville Junior High School, East Aurora, N. Y.

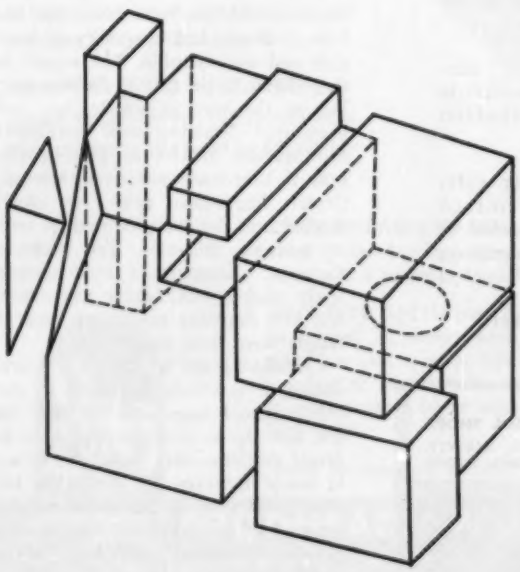
This novelty drawing test serves to measure visualizing ability of students in beginning mechanical drawing. It is graded objectively and a time limit is placed on each construction according to difficulty. A three-dimensional visual aid is used with portions cut away. These can be removed to form six different geometric figures. The testee is asked to draw orthographic sketches of each of the six different combinations contained in the visual aid, starting with a simple rectangle. If he understands orthographic projections and if his ability to visualize is good this will serve not only as a teaching device, but measure his ability to translate from solid three dimensional objects to orthographic drawings as well.

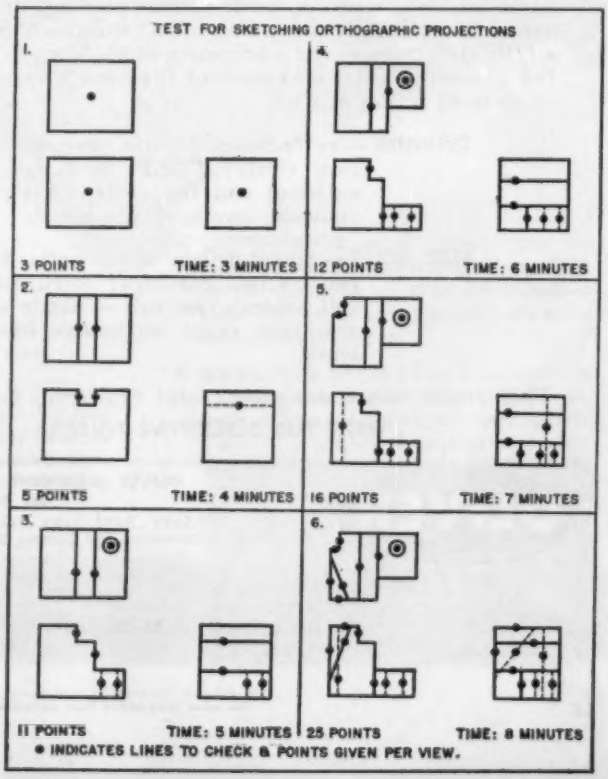
The following scale may be used for grading:

Scale for Grading
(Total Score 72 Points)

72 — A	36 — C
66 — A—	30 — C—
60 — B+	24 — D+
54 — B	18 — D
48 — B—	12 — D—
42 — C+	6 — F

◀





CONCEPTS OF DESIGN

(Concluded from page 34)

cerned with the determining of the exact functions required of the design, and then organizing material elements to best fulfill these functions. The structural part of the "functional-structural approach" is interrelated with the functional, since it becomes obvious that the functional elements must eventually be transformed into a physical structure. Structure, as used here, includes the materials used, the forming of the materials, and the organization of the formed materials into a functioning whole. It is the structural emphasis in design that shows the clear relationship between design and the objectives of industrial arts.

Artists often create designs that are of great beauty and high artistic merit. If they are not adaptable to utility, however, the basic purpose of the object is lost or subordinated. The artist-craftsman is his own best designer, for he will scrutinize and criticize his product from the essential viewpoint of service. Not only will he choose a bold or a delicate design according to the characteristics of the materials employed, but he will also insure that a chair is comfortable or a table is structurally sound and of proper height. The same will be true of his selection of contours or embellishments, for as a craftsman he is always aware of the basic requirement of structure, function, and aesthetic values.

In considering the shape or outline of furniture, structure again exerts a deciding influence. The formation of the basic structure is determined by the purpose the piece will serve and by the materials of which it is to be made. This basic shape can be modified to a graceful outline only to the extent that it will not impair the fundamental requirement of utility. The same is true of the shaping of divisions and other decoration. Structural characteristics may aid in achieving unity of design and the achievement of a restrained dignity through the blending of simplicity, proportion, and successful eye guidance. Design cannot be considered as a mere abstraction unrelated to structural requirements.

In our industrial arts classes we sometimes note failure to consider structure when developing a design. A student may bring a drawing to us in which he has stood four sticks under a board and expects the assembly to become a table. When questioned about structure he has no idea of how to join the legs to the table. He has not gone far enough in his study of structure to be able to design a table. He is ready, however, to begin the research out of which a design may emerge.

Design cannot precede knowledge of structure, and structure without design can be very uninteresting. Instruction in design and structure should develop harmoniously from the first work and continue throughout the students' experiences in industrial arts.

7. Influence of Tools and Machines

There is no doubt that a great many machine-made products have been bad, both in design and in quality of materials and workmanship. The reason for this seems to lie not in the machines, but in the way in which they have been used. Machines used intelligently can produce articles of good quality, but, if they are to do so, their particular limitations must be closely studied and designs produced in terms of machine processes. Too often, in the past, designs have been thoughtlessly copied with hardly any adaptation for available equipment, and the results have been disastrous.

Considering the limitations and availability of machines and tools in some public school situations, one may well ask how the various operations on different machines may be taught. Indeed, in many instances this cannot be fully accomplished in the industrial arts program, but certainly the teacher must possess knowledge and skill far beyond that of his students.

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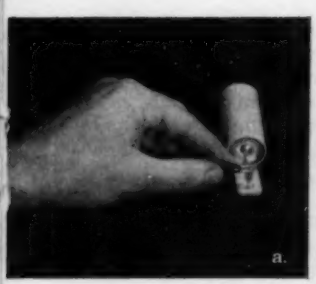
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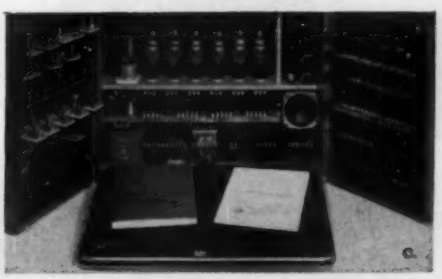
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special report

ADMINISTERING INDUSTRIAL EDUCATION

A series of articles for the administrator of the local school district designed to (1) explain industrial education; (2) discuss its unique and vital contribution to the secondary school curriculum; and (3) offer data for the reader to use in impressing the importance of this field to the American high school student to various groups. . . .

— Ohio State Department of Education

TECHNOLOGY AND INDUSTRY IN OUR SCHOOLS

It is said that science discovers the nature of man's world or universe and that technology uses these findings for man's benefit or destruction. It should be obvious to any thinking person that our school program should represent this area of technology and industry.

In education related to technology there are three distinct programs: (1) industrial arts, (2) vocational-industrial education, and (3) technical education. Let's take a look at the purposes of these three programs. While these are distinct programs, there is some overlapping.

1. Industrial Arts

Industrial arts is a study of the tools, materials, processes, products, and occupations of our industrial society. A good industrial arts program starts at the junior or intermediate school grades (7th, 8th, and 9th), and includes a wide variety of experiences in drawing and design, metalworking, electricity-electronics, power mechanics, woodworking, graphic arts, and the industrial crafts. Smaller schools include all or most of these in a single shop called a "general shop," taught by one teacher. Larger schools have several shops with a team of teachers, each a specialist in one area. In general shop the four areas of drawing and design, metalwork, woodwork, electricity and electronics should be basic.

At senior high school level, good industrial arts is an advanced exploratory experience for all students. For some students it will include pre-vocational instruction in a broad family of occupations such as metalwork, woodwork, drafting, electricity-electronics, power mechanics, auto mechanics, and graphic arts. For example, a general metals course should include experiences in machine shop, welding, foundry, forging, sheet metal, heat treating, and bench metal. A good industrial arts program affords students an insight into American industry, the source of raw materials, how basic materials are processed, how products are designed and produced, and how people earn a living. It teaches students how to design, plan, and do problem solving (construction of products) in which the common materials of industry such as metal, leather, plastic, wood, and other items are employed. It teaches basic hand and machine skills that are useful to everyone whether for vocational competencies or for recreational purposes. It provides an opportunity for students to discover their aptitudes and abilities in the various fields of technology.

2. Vocational-Industrial Education

Vocational-industrial education, sometimes called trades and industry, is preparation for entrance into and upgrading in a skilled industrial trade or occupation. It is a program planned to improve efficiency in a specific occupation either in preparation for employment or to improve abilities on the job. Vocational-industrial education is for students who *want it, need it,* and *can profit by it.* In other words, a student through proper guidance, can choose instruction in some particular occupational area in which there is interest and which provides a reasonable assurance of earning a living. These might be such traditional programs as Machine shop, carpentry, or auto mechanics; or more recent programs for the training of such craftsmen as maintenance electrician and appliance repairman. A successful vocational-industrial program is

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based on: (*a*) a study of the occupations or families of occupations that will provide employment opportunities, (*b*) a study of the aptitudes and interests of the students who wish to enter these programs, (*c*) adequate help in guidance to aid students to make the right choice of occupation, (*d*) adequate shops and courses to represent the important industrial occupations of the community or area, (*e*) a good program of placement for graduates, and (*f*) a co-operative follow-up program with opportunities for additional training and education.

All readers will agree that the surest way to give the "kiss of death" to these vocational-industrial programs is by arbitrary assignment of students who do not succeed in academic areas. Vocational-industrial education can be, and is, a part of the 11th and 12th grade high-school program. There is a definite trend, however, toward making these programs an integral part of the "post" high school, 13th and 14th years. If the programs are of good quality, it is difficult to tell where good industrial arts ends and good vocational-industrial education begins. (It has nothing to do with distinction based on federal funds.)

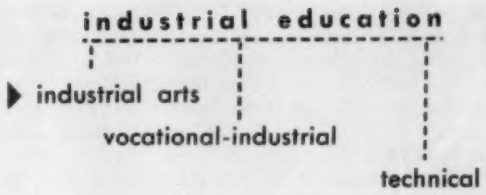
3. Technical Education

The third program, *technical education,* the newest in our education system, has developed largely in the last 20 years. As the tempo of technological change has increased and as the complexities of our industrial system have multiplied, it has been increasingly evident that there is a large gap between the educational needs and duties of the engineer and the training and duties of the skilled craftsman. This void or gap can be filled by the person we call, "the technician." It has been estimated by various reliable sources that industry needs from six to twelve technicians for each engineer.

It will be difficult to describe in specific terms the exact nature of the work of a technician since he must perform a wide variety of work. Technicians work in manufacturing, distribution, sales, or servicing. They must have a great deal of "know" — in fact, more "know" than "knowhow." This means that they must have a firm foundation in the math and science of their particular area. Some of the more important groups of technicians include those working in electronics, instrumentation, drafting, chemistry, etc. Programs of technical education may start at the high-school level. However, they are usually two-year programs of a "post" high school or college level and, in many cases, four-year college degree programs. Here, again, it is difficult to tell exactly when industrial arts or vocational-industrial education ends and technical education begins. For example, a school might offer an industrial arts program in auto mechanics open to all students; then there might be an auto mechanics program for those students who wish to become skilled repairmen: and finally, there might be a two or four-year program of technical education in transportation to prepare the technicians who must understand more about the science and technology in the manufacture, distribution, and service of these means of transportation (automobile and aircraft).

These three programs have much in common, even though the aims, purposes, students, facilities may be different. Therefore they are often grouped together for purposes of administration, supervision, and organization. For convenience, the programs are called by the generic term of *"industrial education."*

We believe that the above represents the composite thinking of the majority of leadership in industrial education. As an administrator of one of our American schools, we hope that you find this issue of help in clarifying many aspects of the programs. — *J. L. F.*



Industrial arts, a phase of general education, makes a definite contribution to all levels of our schools today —

Why—The Industrial Arts

MARSHALL L. SCHMITT

Dr. Schmitt is specialist for industrial arts, U. S. Office of Education, Department of Health, Education, and Welfare, Washington, D. C.

Main Street, U. S. A., in 1961 is a great deal different from that same street in 1911. No longer is it possible for youngsters to stand by the "open door" to watch the village blacksmith with his sinewy arms and blackened hands twist red-hot pieces of metal into shapes for use on wagons, plows, or ornamental fences. No longer is it possible for them to watch the local miller. One finds that the local grist mill has all but disappeared. Broken paddle wheels and a heavy growth of bushes covering the once proud building are only reminders of days long past. The chance to watch a system of conveyors in a continuous production line to process flour is not available to these children. Nor is the slaughtering of animals, gathering food, making clothing, and helping "raise a barn," a part of the experience of most present-day youth.

Even the gasoline stations that dot the corners of many crossroads do little "real work" on automobiles other than feeding the bottomless gas tanks, cleaning windows, adding water to steaming radiators, and opening cans filled with a syrup-like liquid called 20 or 30 weight. When these chores are completed, engine hoods are closed with a snap and the attendant does not even have to calculate or make change — he just looks at a dial and writes figures on a pad.

On some farms, huge combines line up in precision order and with an insatiable appetite sheer a field of golden wheat,

so it looks like a new mowed lawn. Trucks with bodies groaning and tires bulging move the precious grains to storage bins — finally, some of the grains appear as a loaf of bread in a super market.

These scenes can be repeated and repeated with the products of industry that are a part of the lives of all of us. From everyday plates to Sunday china dishes, from bicycles to automobiles, from dog houses to home dwellings, from doll dresses to a closet full of clothes, youngsters use end products but have little or no chance to learn the romance of their manufacture. The inspiration, the sweat, the search for new products, the never ending process to improve life and make a better world escapes most children of today.

Where in the education of our boys and girls will they learn about the "behind the scene" activity? Where will they hear the clang of metal so characteristic of forge work, feel the heat of a white hot ribbon of steel, listen to the pulse beat of the drop hammer, smell the odor of plastics, feel the dampness of the moisture laden air of a spinning room, use a well-balanced tool, fabricate products with earth and synthetic material, control machines, and work hard at worthwhile tasks? It is in this area of living that "the industrial arts" makes its greatest contribution to the education of all youngsters.

The Industrial Arts

If we subscribe to the postulate that a major purpose of education is to transmit a way of life, then the industrial arts must become a part of the total education program so as to reflect today's complex industrial life. From the earliest time to the present — even more so in the future — man will need to work with tools, materials, and machines. These are the things of technology which give body to ideas formulated in the mind. The industrial arts, as a curriculum area in the schools, provides the setting for students to learn about industry — the user of technology — and experience the act of creating from materials, new and different forms which have greater human value. In so doing, students will be able to understand and be sensitive to materials, processes, machines, tools, principles, applications, operations, opportunities for work, quality of products and service, maintenance, achievements, the significance of technology and its effect on society and the individuals within that society.

Like the curricula areas of language arts and social studies that have courses like creative writing, history of literature, penmanship, English, drama, world history, current events, and American government, the industrial arts offers courses like laboratory of industries, transportation, general metalwork, electricity/electronics, graphic arts, general woodwork, and ceramics for students to learn about the technical side of society — man's control over his environment. The industrial arts makes its contribution in all levels of public education; elementary, junior high, and senior high school.

In the Elementary School

In the elementary schools, industrial arts activities enrich the broad units of instruction. The students work with common materials like paper, clay, rags, pieces of wood, metal, clothing, and leather by direct experience. Hand tools provide in the main the devices by which these materials are cut, molded, drilled, and shaped to meet the needs of the learners. Some limited power tools may be introduced in the upper grades. These direct experiences lay the groundwork for understanding our technical society and the interrelationship of goods and services to everyday living.

"How many sixths are there in a third?" asked a fourth grader of her teacher after a session with the problem. "I still don't understand," the little girl said. The teacher then took a pair of scissors, a pencil, compass, and a piece of paper and cut a circle into six equal parts for her. Without hesitation, the child said, "Oh yes, I see now. It is two sixths." Abstract concepts can be made more meaningful with concrete evidence. The foregoing illustration is one of many ways in which tools and materials can be correlated with teaching units.

Forming clay bowls and pots like the Indians did when this country was young makes their civilization in a social studies unit come to life. A farm yard built to scale has a great many implications. How paper, clothing, pots, pans, food, and scores of other things are produced and the importance these things have in the lives of children is made clearer by direct experience with them.

In the Junior High School

The industrial arts as an integral

The Modern Image of Industrial Arts

It is not:

1. **Woodwork as such.** Many people still think that industrial arts is a kind of shopwork in which rather badly designed wood projects are made. Wood is only **one of the many materials** used in modern industrial arts.

2. **It is not handwork just to keep students busy.** Developing elementary skills in the use of hand and machine tools is only one of the learnings; information, concepts, applications, problem solving, and development of proper attitudes are all a part of the learning process.

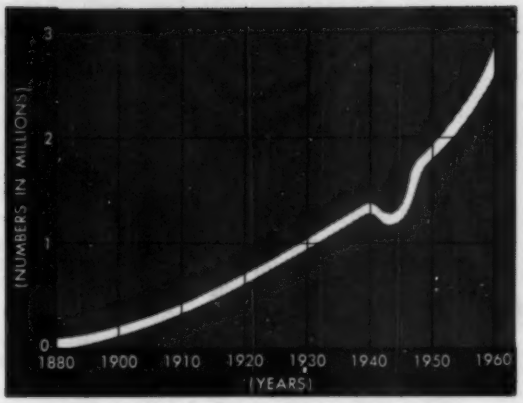
3. **It is not for the student with limited academic ability.** A slow learner may find some success in a shop program, but the brilliant student will also find an opportunity to do problem solving with the use of tools and materials. The engineer of tomorrow must know how to use materials and processes to make his ideas become realities.

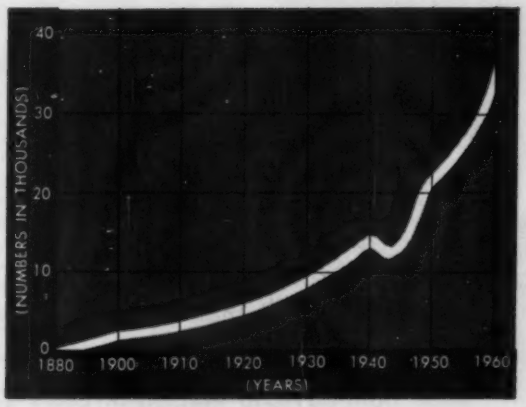
Like the **automobile,** industrial arts has changed with the years:

1. It started with **manual training, 1880–1915,** as a program in which the students made wood exercises. The objective was to train the hand, the heart, and the mind.

2. It grew to be **manual arts, 1915–1925.** Art and design were added to the woodworking processes so that students might make useful furniture items. Wood and drawing were stressed as the fundamentals of manual arts.

3. It is now **industrial arts,** a modern curriculum area representing some of the major industrial facets in American life. It includes **electricity and electronics** (a study of how to harness the electron); **power mechanics** (a study of the use of power from small gas engines to rockets); **metalworking** (a study of the hardware of missiles, rockets, automobiles, and most hard goods that we use); **woodwork** (a study of the basic materials for homes, furniture, and thousands of other consumer items); **drafting** (the language of industry); **graphic arts** (a study of the reproduction of pictures and words by printing and other related methods); and **industrial crafts** (a study of the use of plastics, leather, ceramics, and other materials used in both industry and recreation. — J. L. F.





Graphs showing the steady increase of enrollment (left) and teachers (right) in the field of industrial arts from its beginnings.

part of the junior high curriculum (grades 7, 8, and 9) provides boys and girls with the opportunity to experience work in many different aspects of industry. Laboratory of industries, woodworking, metalworking, ceramics, drawing, textiles, and graphic arts are but a few of the broad subject matter courses that may be offered. The basic industrial processes, including tools, machines, and materials with their related human problems constitute the source of curriculum content. Emphasis in this program is breadth of industrial understanding and experience in as many activities as feasible. One has but to watch the expression on the face of a seventh grader the first time he uses a jigsaw instead of a handsaw to cut a piece of wood. The importance of "power" is fully demonstrated in this act. Alert teachers capitalize on direct experiences like these to give real meaning to understandings so difficult to teach.

This important period of life for the young adolescent needs school experiences which help him achieve self-confidence, aid him in the choice of a career, and help him acquire a set of values which will help guide his behavior. Sampling many kinds of work is one way in which youngsters find out their interests and abilities. This self-analysis is vitally important since the choice of selecting a curriculum in the senior high school is not far away.

Over this three-year period, the student can decide more intelligently on his own goals. The world of work or advanced education holds for him some apprehension but planning and building a project, working side by side with his fellow classmates in a more natural social setting, experimenting, and completing worthwhile tasks help dispel anxiety about the future by giving him confidence to handle problems in the present.

In the Senior High School

Senior high school industrial arts provides the opportunities for students to receive advanced work in various courses sampled at the junior high school level. It is particularly valuable for students with interests and abilities in the technical and scientific fields. A detailed study of a local or a national industry gives students insights into mass production principles; importance of interchangeable parts; quality control; plant organization; personnel; time study; materials handling devices; automation; importance of jigs and fixtures; the need for detailed drawings; experimental prototypes of products; and the constant struggle of industry to improve quality, increase production, and reduce costs.

A well-rounded senior industrial-arts program includes advanced courses reflecting a variety of industries. Understanding how production principles apply to industries where techniques of manufacture differ radically points out to students how industrialization affects all people. New methods in transportation, communication, manufacture, and the development of new ways of generating power are constantly affecting the lives of all of us. The result of the application of this new technology in these fields necessitates constant revision of curricular materials in industrial arts so as to reflect these changes.

The industrial arts provides the student opportunities to use what he has learned in physics, chemistry, and mathematics. Building a machine using a vacuum pump to cause atmospheric pressure to force heated sheet plastic against a curved mold is but one of many examples of applied science in action. Making a working model of a rocket engine or electric computer are other examples. The opportunity for correlation of the physical sciences and mathematics with the industrial arts exists — ways must be found for the student with a science background to work, experiment, and develop in as far as possible, new processes and new materials. Men like Franklin, Edison, Armstrong, Curtiss, and Westinghouse may come from this group.

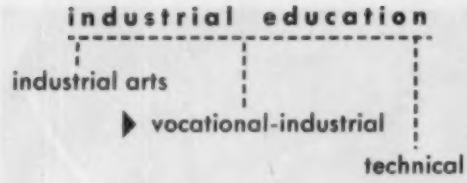
In Summary

In the elementary school (grades 1-6), the industrial arts offers enrichment to the broad areas of study such as: home and school, neighborhood, community, lands of other people, life in America and other lands. The industrial arts helps develop a clearer understanding of the people who do the work of the world. The students learn the use of hand tools, some machines, materials, and processes as they affect people in making the world a better place in which to live.

The junior high school provides for all boys and girls a variety of experiences to discover their interests, abilities, and attitudes with regard to industrial life — its occupations, processes, tools, materials, and machines. These experiences help provide a basis for helping students make a choice of a career and help them become better consumers and understand industrialization and its impact on our country's society.

Senior high school industrial arts provides all-around technical understanding, opportunity for correlation with the physical sciences and other courses, for intensified study of technical problems related to industry, for an increased level of competence in the use of tools, machines, and materials. It provides the graduate with a fundamental understanding of our technical society and a broad technical background for ready adjustment to the changing world of our time.

The schools must provide a qualified teacher, a place to work, enough tools, machines, and materials to serve these students. The industrial-arts curriculum area can be to students in school what technology is to adults in industrial life. To be educated liberally today, one needs technical understanding.



▶ Vocational-industrial education is **part of the curriculum of most school districts** in both day and evening divisions —

What is Vocational Industrial Education?

The vast scope* of American industry, together with its changing nature, has required programs of education and training of various types for its ever increasing labor force. Since the beginning of American industry, programs of education and training have been provided by apprenticeship, by corporation, and by proprietary, endowed, and public schools. The combined efforts of all these agencies and institutions are presently required to supply workers with needed competencies for efficient production in industry. The public school program, which is the newest of the industrial education programs, has had its greatest expansion since the passage of the Smith-Hughes Vocational Education Act of 1917. This law has stimulated the development of industrial education programs in times of peace and in times of war. This program, which was termed the trade and industrial education program, is now also known as the vocational industrial education program.

Vocational-industrial education is defined as instruction which is planned for the purpose of developing basic manipulative skills, safety judgments, technical knowledge, and related occupational information for the purpose of fitting young persons for initial employment in industrial occupations and of upgrading or retraining workers employed in industry. Vocational industrial education courses are given in trade schools, in technical schools, in general-purpose secondary schools and in factories and industrial plants. The present-day apprenticeship program, in which the school co-operates with industry and labor, is included in vocational industrial education.

Vocational educators have experienced some difficulty in differentiating between the various groups of occupations in vocational industrial, vocational technical, and professional vocations in industry. The vocational division, U. S. Office of Education, has defined a vocational industrial occupation as "any industrial pursuit, skilled or semi-skilled, trade, craft, or occupation which directly functions in the designing, producing, processing, assembling, maintaining, servicing, or repairing of any manufactured product; and any service, trade, or occupation which is not classified as agricultural, commercial, professional, or homemaking." Most of the occupations listed in the U. S. census reports under headings related to manufacturing, construction, mining, transportation and public utilities and some of the occupations listed under forestry and fishing and under domestic and personal services are classed as vocational industrial pursuits.

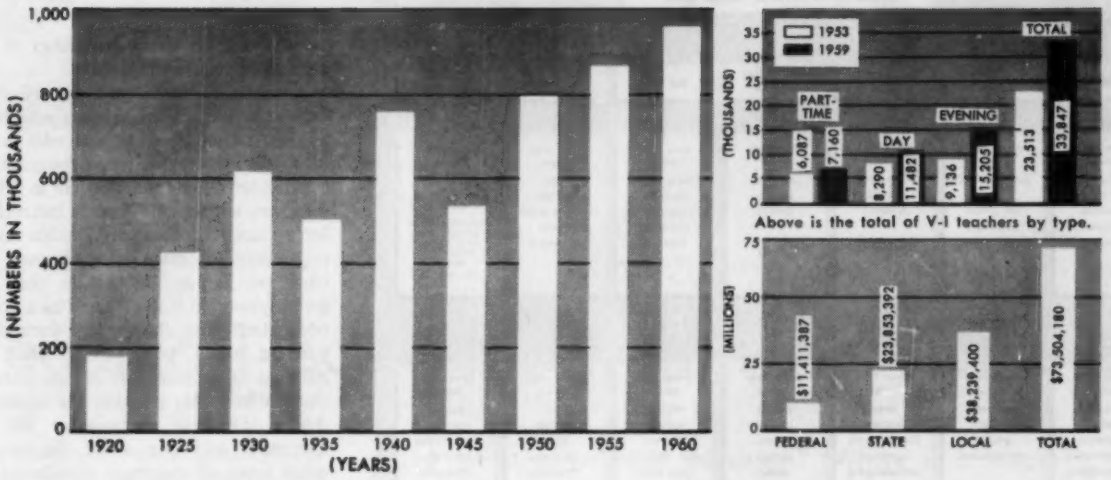
A functioning program in vocational industrial education is constantly undergoing changes to meet new needs. This means that the program must not only cover existing occupations but must also contemplate new ones growing out of technological developments. This requires that educators in charge of vocational-industrial education programs maintain close relationships with workers in industry and be on the alert for changes in industry that affect programs in vocational education. Industry also has an interest in this program to be assured that workers in vocational industrial education are properly trained for their responsibilities.

Development of V-I Education

Few industrial education programs had been developed in the public schools of the nation prior to the passage of the Smith-Hughes Vocational Education Act. This law resulted in the organization of vocational-industrial education programs of some nature in every state during its first year of operation. These programs have expanded in scope and variety during the years since 1918.

*Excerpt from "Vocational and Practical Arts Education," by Roy W. Roberts, by special permission of Harpers & Brothers, Publishers, New York.

— Harry Goldstein



Graphs showing the enrollments (left) and expenditures (right) for vocational-industrial education.

They have been characterized by *flexibility* to meet changing conditions, *high standards* to provide superior workmen, and *adaptability* to meet the needs of the various kinds and grades of workers. These characteristics are implied in the purposes or objectives which have served as guides in the development of the vocational-industrial education program.

Modern industry finds a need for training unskilled workers, semiskilled operators, skilled mechanics, foremen, junior technical workers, engineers, and other high-level technical workers and executives. The training of engineers and executives is usually assigned to the colleges.

Skilled and semi-skilled workers receive education and training on the job and in vocational-industrial education schools and classes. It is usually to the advantage of both the employer and the employee to provide training for the unskilled worker necessary for efficient production and for safety in plant operation. This training should be given by a competent individual, either the foreman or a qualified instructor who has had foremanship or instructors' training courses.

The semiskilled worker usually has responsibility for operating production machines. No extensive training is needed since most of these machines are automatic, but a short period of instruction and practice is necessary. The skilled mechanic requires extensive knowledge and skill commonly acquired in apprenticeship programs, trade schools, extension classes, and corporation schools. The necessity for training foremen and supervisors is becoming more apparent in industry. These employees need to know about company policies, efficient production methods, and how to deal effectively with employees.

The various kinds of workers and the differences in the training requirements of these workers suggest a need for a statement of principles to serve as a guide in the development of the various kinds of training programs needed. Guiding principles in terms of major objectives have been established for the vocational-industrial education program. These major objectives are as follows:

1. To provide instruction of an extension or supplemental type for the further development of performance skills, technical knowledge, related industrial education, safety, and job judgment for persons already employed in trade and industrial pursuits.

2. To provide instruction of the preparatory type in the development of basic manipulative skills, safety judgment, technical knowledge and related industrial information for the purpose of fitting persons for useful employment in trade and industrial pursuits.

The major objectives are useful as a guide in over-all planning, but more specific statements of objectives are required in local vocational-industrial education programs. These specific objectives should be based on local needs. Various methods are used to determine local needs. Among these are questionnaires to be filled out by workers or employers, personal interviews, spot checks, employment service information, advisory committees and information from social, civic, and religious groups in the community. The information provided from these sources together with the statement of major objectives will enable the vocational industrial educator and his interested committee to determine the kinds of schools and classes needed in the local program of vocational industrial education.

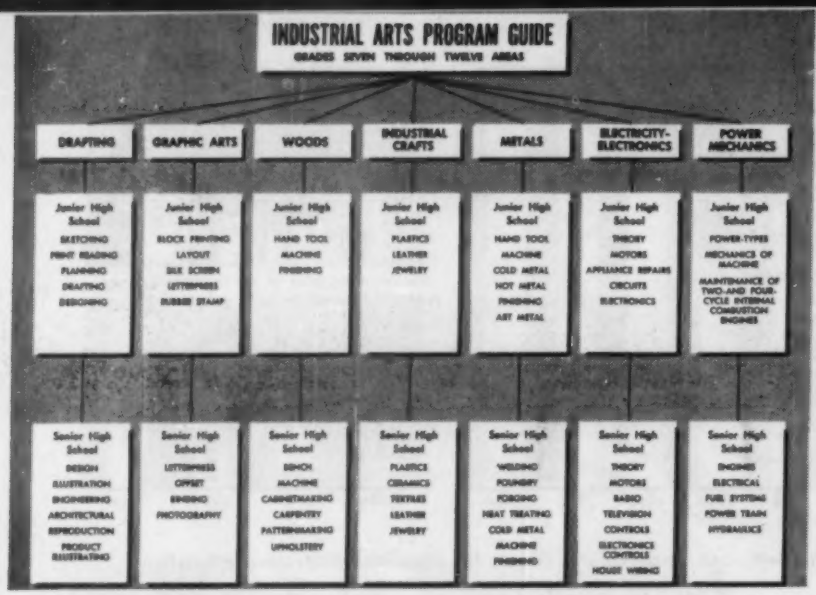
Types of V-I Schools and Classes

A complete program of vocational-industrial education includes various groupings of schools and classes. These groupings change from time to time to meet changing conditions. A recent grouping of classes was suggested by a number of committees, composed of professional workers in vocational industrial education. This grouping includes: (1) classes for secondary school youth who are regularly enrolled in school, (2) co-operative classes for secondary school youth in which work experience is combined with organized classwork in school, and (3) adult classes for employed workers. The adult classes are further divided to include trade preparatory courses for post-high school youth and adults leading to employment in industry, extension courses for employed adults which may be held during their working hours or during their nonworking hours, and supplementary or foreman training courses of an extension nature designed for supervisors or conference leaders in industry.

A more detailed grouping or classification of schools and classes in vocational industrial education was suggested in the bulletin of the Vocational Division, U. S. Office of Education, entitled "Administration of Vocational Education." This classification, which includes essentially the same kinds of schools and classes as are suggested in the above grouping, has been used since the beginning of the vocational education program for statistical reporting. This classification includes three major types — evening, part-time, and all-day trade classes.

Evening Classes

An evening class is one which is conducted for employed workers in industry, including supervisors and foremen. This class is held during the nonworking hours, and instruction given under the provisions of the federally-aided program must be designed to extend the skill or knowledge of the worker in the trade in which he is em-



ployed. This class, which is referred to as an evening extension class, may include manipulative skills, technical instruction, safety, first aid, and the economics of the occupation. The minimum age of the enrollees is 16 years, but as a rule they are older.

The instructor is frequently an employed worker in the trade he is teaching and is paid on an hourly basis for teaching the class. Some instructors for extension classes are employed full time by the state board of vocational education or the local school board. Instructors employed by the state board are frequently referred to as itinerant or traveling instructors. They go from town to town and conduct classes previously planned and organized by representatives of local boards of education.

Part-Time Classes

A vocational industrial education class conducted during the usual working hours of the enrollees is referred to as a part-time class. This class is designed to provide instruction in subjects given to increase the civic or vocational intelligence of workers over 14 years of age who have entered employment and who are permitted to leave their work stations during some of their working hours for instructional purposes.

There are three kinds of part-time classes designed to meet the special needs of employed workers. These are: (1) part-time trade extension classes, (2) part-time general continuation classes and (3) part-time trade preparatory classes. A part-time trade extension class, like an evening extension class, is designed to extend the knowledge of the trade in which the enrollee is employed. Classes offering related training for persons who are employed, paid and taught as apprentices are included in this classification. A co-operative, part-time, trade extension class may be organized for a group of workers, all of whom are employed in the same trade. Work and attendance at school may be on alternate half-days, weeks, or longer periods of time.

A part-time general continuation class is conducted for employed persons for the purpose of increasing their civic or vocation intelligence. This type of instruction was originally intended to meet educational needs required to satisfy state compulsory education laws for out-of-school youth, which could not be met in part-time extension or trade preparatory classes. It is now used also for workers above the compulsory school age who are employed in a wide range of occupations.

General continuation classes are of two types, co-operative diversified occupations and other. A co-operative diversified occupations, or D. O., class is one in which high school students are given supervised work experience in any one of a variety of occupations, combined with related classroom instruction. The study in school and work on the job are planned and supervised by the school and the employer, so that each contributes to the student's development in his chosen occupation. Work periods and school attendance may be on alternate half-days, days, weeks or other periods of time; but the hours at work must equal or exceed those spent in school during the regular school year and must not be less than an average of 15 hours per week. Classes involving a combination of diversified occupations students and co-operative part-time distributive education students are organized in some states. Part-time general continuation instruction other than co-operative is frequently given to young workers who did not have an opportunity to complete their education before they entered employment. Instruction is offered which enables young people to meet changing conditions in their vocations or to meet more effectively their citizenship of occupational requirements.

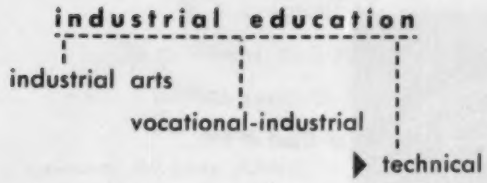
A part-time trade preparatory class may be organized for workers who have left the full-time school and who desire to fit themselves for employment in an occupation other than the one in which they are employed. This is instruction for a change of occupation which serves to prepare the trainee for the new occupation. Group instruction may be given, provided it is confined to a single occupation. The class meets during the working hours, which means that the enrollee is required to obtain permission to leave his position for schooling during this time. Because of this requirement and because of the various other types of programs, enrollments in part-time trade preparatory classes are small.

All-Day Trade Classes

All-day trade training is given to full-time day school students who desire pre-employment training in a selected occupation. The training includes instruction in skills and related training. Three types of all-day training classes are provided under the provisions of the federal vocational education acts; these are type "A," type "B," and type "C" classes.

Enrollees in a type "A" class spend one half of the school day in practical work in the school shop on a useful or productive basis with additional time in the classroom given to instruction in organized classes in technical and other related subjects. A type "B" class differs from a type "A" class only in the provisions for related instruction. In a type "B" class related instruction is given by the shop teacher in the half-day devoted to practical work in the school shop. The remaining half-day is usually given to general education subjects. Type "C" is a special type of pre-employment training which may be organized in the school shop for persons over 18 years of age or for those 14 years of age or over who have legally left the regular day school. Such training may be offered for any length of time desired, and shop and related training classes may meet less than the time specified for types "A" and "B" classes.

The all-day trade classes, types "A" and "B," are scheduled five days per week for a minimum of nine months per year. The entrance age is a minimum of 14 years, and admission is usually restricted to students who are physically able and mentally competent to profit by the instruction. A unit trade course based upon instruction for a trade or occupation, or a general industrial course where shop instruction in several closely allied trades is conducted simultaneously, may be given.



Technical Education: The New Needs

What is technical education? Where is it taught? What does it teach? What is the government's role in this newest division of industrial education?

In recent years, much misunderstanding has developed concerning the use of the terms *technician*, *technical*, and *technology*. There seems to be little consistency among the positions referred to as technical. Industry, engineering, medicine and dentistry, education, public service, and other broad fields of endeavor use the word *technician* in connection with a variety of vastly different jobs.

However, in answering the question, "What does the technician do?" certain definitions can be cited.

The U. S. Department of Labor has described the term *technician* as "a large and loosely defined group of occupations at many levels of skill and with a wide variety of training requirements. In general, technician jobs fall between those of the skilled craftsman and the professional engineer and scientist and has a practical rather than a theoretical orientation. Frequently, technician jobs require use of complex electronic and mechanical instruments, experimental laboratory apparatus. . . . Almost all technicians must be able to use engineering handbooks and computing devices such as the slide rule or calculating machines. Technicians are utilized in virtually every activity where know-how is required. One of their largest and best known areas of employment is research, development, and design work."

The U. S. Office of Education, in presenting regulations to govern the administration of Title VIII of NDEA, stated that:

The following characteristics of highly skilled technical occupations which require a scientific knowledge are suggested as basic minimum criteria:

1. The occupation lies between that of the skilled crafts and the scientific professions.

2. The occupation requires technical competency based upon specialized, intensive training in technical subjects involving the direct application of functional aspects of related sciences and mathematics.

3. The occupation is one in which most of the person's work is concerned with the application of technical knowledge and technical understanding in contrast with manipulative skill.

Performing in hundreds of differing occupations, the technician combines to a varying degree the "know why" of the engineer and scientist and the "know-how" of the skilled craftsmen. Although neither graduate professional engineers nor expert craftsmen have competencies in both areas; it is this wide, overlapping band of duties and activities which constitute the technician's field.

Kind of Education Needed

The tremendous and rapid technological changes taking place in industry today are having great impact on education throughout the country. The large, complex, and rapidly growing area of technical employment makes it necessary that educators throughout the country, especially in industrialized sections, provide expanded training programs in various technologies of industry. Since the technician has only recently joined the industrial team, the traditional pattern of training for industrial employment, which consisted of training the craftsmen and training the engineer, is still slowly meeting the new educational needs of the technician.

This need is being met in a number of educational approaches:

1. *The technical institutes.* Both private and public institutions, they offer programs varying in content from a completely technical curriculum to a well-balanced including both technical and general subjects.

2. *Technical high schools.* Operated by local school districts, they have

Goal of T-E:
"Provide, establish, improve, and expand educational programs of high quality designed to prepare, update, and retrain workers to meet the increasing needs for technicians capable of supporting scientists and engineers in new and rapidly changing technologies. . . ."

— U. S. Office of Education

programs which, while concentrating their curricula on trades and industry training, have basic courses in such subjects as electricity-electronics on the technical level.

3. *Junior, community colleges.* Two-year, local school district schools, they have full-fledged programs for the technical in electronics, instrumentation, design and drafting, etc.

4. *Technical programs in universities and colleges.*

5. *Technical training programs by industry.*

These constitute the major avenues of current technician education. There are, of course, other approaches which may enter the field in one phase of the total educational program.

In answering the question of "what should the technician be taught?" let's analyze the somewhat typical programs of the two and three year Technical Institute of Temple University in Philadelphia. This school has a five-part curriculum in its day program:

1. Air conditioning, heating, and refrigeration technology
2. Architectural design and building construction technology
3. Chemical technology
4. Electronics technology
5. Mechanical design technology

The average number of class hours per week is 22 with laboratory work generally comprising less than one third of the total. Credit hours average 18 in each standard 15-week semester. The schedules concentrate courses in the last two semesters about the humanities.

Achievement is measured one of two ways. Students successfully completing six semesters earn the degree "Associate in Technology." Those terminating studies at the end of four semesters may receive a "Certificate of Proficiency" if the work done has been satisfactory or better. This applies in general in the evening division, too, but more semesters of attendance are required there as students are limited to enrollment in three classes per week. Course offerings and content also vary somewhat.

Finally, a brief consideration of a typical subject in the curricula might be necessary to present the true picture. Technical mathematics, for example, embraces trigonometry, algebra, geometry, and the like up to calculus with emphasis on log and slide-rule applications. Problems selected are those most appropriate in the study of mechanical design or electronics as the case may be. The idea is to have math and all the other subjects concentrated about one core, thereby trimming as much unrelated matter from each curriculum as possible. It is evident, then, subjects such as physics and technical writing listed under "Mechanical Design Technology" would be taught with different emphasis than subjects of the same title given in other curricula.

Federal Stimulus

In the important Office of Education report, "Vocational Education in the Next Decade," the chapter on "technical occupations" explains the reason for present national concern and federal help toward the education of technicians, as well as illustrating programs which should be developed in the future.

The chapter states that "Recognition of the existing shortage of highly skilled technicians as well as the growing future demand for such workers with each new technological development prompted the 85th Congress of the United States to include Title VIII in the National Defense Education Act of 1958. The purpose of the program is to train highly skilled technicians in recognized occupations requiring scientific knowledge essential in the fields necessary for national defense. . . .

"Another purpose of the Title is to encourage the development and expansion of the area concept so that training opportunities might be made available to qualified persons who may not have had such opportunities in the past because of their geographical location or the absence of training centers near their place of residence. Area vocational education has expanded greatly since the passage of the Act and the intent of this part of Title VIII is being achieved."

In Summary

Mirroring the explosive, rapidly changing status of American industry, technician education incorporates a vast system of ramifications which are not as easy to define as those of its sister fields of industrial education, industrial arts and vocational-industrial education.

The public school administrator, however, should follow these developments for inclusion or possible expansion of technician education program in his comprehensive high schools, in his special technical or vocational high schools, and in his two-year community colleges. ◀

▶ A program for preparing students for the world of work — its problems and requirements with suggestions for expansion — is a special concern for the "Great Cities'" superintendents . . . and here is a brief report about their work in this area —

Industrial Education and the Well-Balanced High School Program

SAMUEL M. BROWNELL

It was about four years ago that the superintendents and one or two school board members from about a dozen of the largest cities, along with industrial education directors, devoted about two days to discussing the special problems of the great cities in preparing young people for the world of work.

They realized the increasing significance to United States education of city schools. They knew that about one sixth of the nation's pupils were in the 15 to 20 largest cities and that more large cities were coming into being. They recognized that city occupations are of increasing significance as the place of entry into the work force, for not only are more children growing up in the city but cities are the recipients of great numbers who grow up in rural areas and then migrate to the cities.

Since that time this group has met about twice a year to push forward co-operatively in seeking ways to improve city school programs for preparing youth to enter the work force. From this start have evolved other co-operative projects of special significance to large cities — the school program for the great number of pupils handicapped by a different culture when they migrate to the cities, the special fiscal policy problems of large city schools, etc.

In a voluntary, co-operative way they are operating as the Great Cities' School Improvement Program. A small grant of funds has been made by the Sears Roebuck Foundation to carry forward the vocational study. Progress is being made by individual cities on some portion of the industrial education program on which they agreed to work. Reports of progress are shared between cities and reviewed at the meetings.

What are some of the things growing out of these discussions of special significance? I have tried to summarize them under eight headings.

1. Changes are taking place and impending in the work force of this nation of great significance to industrial education.

The projection of the needed work force calls for expansion more rapidly than the increased number of men that will be available. This points to the essentiality of expanding vocational preparation for women in many fields. But the need is not to be simply for more hands. It is to be a need for more of the trained minds and skilled hands and a lesser need for the untrained and the unskilled. It is to be a need for a work force that can give up skills no longer in demand and learn rapidly new skills for new occupations as they develop.

These changes would lessen the numbers who could hope to prepare as youths for a lifetime occupation, and increase the problems resulting from the necessity of increased time for retraining adults, as well as the necessity of increased capabilities for retraining to needed skills of many whose occupation disappeared due to technological advances.

For example, it was relatively easy during war time to retrain men and women from peacetime occupations to become welders, riveters, and assembly line workers in defense plants and then for them to shift back again. The problem would be quite different if we were suddenly to reduce greatly our present nuclear defense program and try to retrain the great number of released scientists as doctors, economists, and international lawyers.

Dr. Brownell, formerly U. S. Commissioner of Education, is superintendent of Schools in Detroit, Mich.

These changes, too, indicate that vocational preparation is truly preparation for the *world* of work. Fewer and fewer people continue to live in the same area all of their lives. More and more job opportunities cause individuals and families to move about from locality to locality, state to state, and nation to nation. Planning vocational programs to fit community occupations is less and less realistic in meeting the needs of local youth.

2. There are decreasing opportunities outside of school for the less well-prepared to fit themselves for jobs.

Wage scales, employment regulations, automation, competitive prices, all work to reduce the chances for a person to be hired as a novice and to learn on the job. Machines take over on simple jobs. Wage scales are set for the experienced productive employee. Seniority in layoff and re-hiring, unemployment compensation, and other provisions make it increasingly difficult for an employer to afford to employ inexperienced and untrained employees so long as they can secure those who have had systematic preparation. Employers look to schools as the agencies which should prepare individuals ready to begin work with a minimum of on-the-job orientation or training.

The resulting condition indicates that those of least ability — the mentally retarded and the reluctant learners — must be prepared before they leave school for the low-skill jobs. It indicates that those who have more ability, but in the past have occupied low-skill jobs, must be prepared for higher skill jobs. Finally, greater proportions of the potential work force must be prepared for high level skilled and professional positions. There needs to be upgrading of preparation for work *at all levels of ability*.

Check Your Industrial Education Program

1. Do all boys have an opportunity to take courses in industrial education? There should be a requirement of at least one year. Is there time in the schedule for the student to elect it?

2. Does your program include work in electricity-electronics and power mechanics?

3. Do students use textbooks and are they responsible for out-of-class assignments?

4. Is there an overemphasis on the making of projects? Is there too much attention given to display of projects in open-house or spring exhibits?

5. Are students learning to read and make all kinds of drawings — house plans, graphs, charts, maps, and so forth?

6. Do the woodworking experiences in your program include modern methods of home construction, bending and laminating wood, patternmaking, as well as basic hand and machine woodworking?

7. Does your metal shop include experiences in machine shop, welding, foundry, and forging, as well as bench metal and sheet metal?

8. Is good design and problem solving stressed?

9. Are students learning something about industrial procedures and methods or how industry does the job?

10. Does the industrial arts program strengthen the application of math and science?

11. Are students learning about the occupations in our industrial world?

12. Is there an instructional area in which the students can sit down for audio-visual demonstrations and so forth?

13. Is there a course of study on file in your office for every program that is offered in industrial education?

14. Do you expect the school shop to do school repairs?

15. Is an adequate budget available for equipment, tools, and materials?

—J. L. F.

3. Preparation for the world of work involves the entire school program, not just that portion usually labelled "industrial education."

Pupils succeed or fail in their occupations fully as much because of their lack of competence in communication (reading, writing, speaking, listening), their quantitative thinking (arithmetic, science), their care of self (health and physical education, nutrition, safety), their understanding and use of environment (geography, science, history, economics, music, art) and their habits of citizenship (government), which they should learn through practice under guidance of all teachers and in extra-class activities, as from their specific preparation in the portions of their schooling usually labeled *vocational.*

Every educator, then, is in essence, an industrial educator as he influences his pupils to be more effective as productive citizens.

4. Grave social and economic consequences are likely to result if we fail to make it possible for most young people to enter successfully the world of work.

We cannot survey the present city scene without some serious misgivings. Here we see powerful forces at work to keep many young people from entering the world of work. We see automation eliminating many types of jobs formerly open to young people with slight preparation; seniority in job placement to displaced older workers; wage and labor regulations which make it unprofitable for the employer to engage inexperienced and relatively untrained youth. All of these reduce the job openings for young people and leave them with abundant time and energy, but no money or occupation to make them feel responsible or necessary as citizens in the community.

To accumulate in the cities an increasing number of youth who are unemployed and who become increasingly unemployable is to develop a tremendous drain on tax resources and on welfare services to support them. At the same time, this condition contributes to increasing delinquency with all of its ramifications. The alternative which we face is whether we are to develop man power as an economic asset and for community upbuilding, or to produce with the increased manpower a greater economic burden which also becomes an increasingly explosive force to tempt those who would destroy democracy.

5. Industrial education programs and attitudes toward industrial education have not kept pace with changes in the world of work, especially in the cities.

Present vocational programs do not prepare for many occupations that one can enter upon graduation from high school or on many which one can enter with less than high school completion. Present vocational programs tend to center on programs leading to high school graduation, although about 40 per cent of pupils do not complete high school. The programs which we have are probably less effective in the way they are conducted than they need to be and could be if we utilized some of the procedures that have been proved to be effective in the best programs that we have.

For example, there has not been extensive use in the preparation for city vocations of the pattern of extension agents that has been so successful with agricultural and home economics education where the extension leaders work with farmers and homes. Nor has there been in urban areas, in industrial and service occupations, the 12-month employment of teachers to supervise and follow-up on summer work experience projects in service or industrial or similar types of occupations to the same extent as has been true in agricultural and home economics education, in rural and small town areas.

6. The role of counseling and of counselors increases in importance and in difficulty. Counselors need better understanding of the role of all of the school program as it relates to preparation for the world of work.

The specialization of jobs makes it more difficult for parents in these days than formerly to help their children gain breadth of knowledge about occupations in which they might be interested, or the requirements to prepare for many kinds of jobs. Increasingly, there is emphasis given to adding school counselors. This is good. But think, too, of the increasing problem of the counselor in keeping posted on the many kinds of jobs that open anew each year, let alone his having an appreciation of the merits and the drawbacks which should be known to boys and girls who would prepare to enter these vocations. We cannot name persons as counselors whose background is wholly

academic and expect them to understand, be sympathetic with, and to portray intelligently what a boy or girl should consider in reference to job possibilities in vocations about which he couldn't have had even remote contact.

Summer work programs for counselors, such as have been carried on in Detroit and other school districts through co-operation of business and industry, is one way to help with this problem.

Think what vocational choice means to a person and his family — where he and they may live and who will be his and their associates! It places upon school authorities increased responsibilities to see that those who counsel understand vocations in the broadest sense and that *vocational counselors* and *vocational teachers* are closely related, and each understands and supports the other.

7. The role of occupational choice and of occupational preparation is often essential to motivation to continue in school long enough for the pupil to see the need to raise his occupational goal or to prepare him for a job in which he gains the desire and the money to continue education for a vocation requiring still greater preparation.

The first job for which one prepares should never be looked upon as a person's ultimate occupational goal. This is true even in the professions. Thus the vocational choice and preparation in high school always needs to be considered as an initial choice and a preparation for *entering* the world of work, a first step only in vocational preparation.

An argument is advanced by many that secondary pupils should avoid early vocational decisions and devote their energies to a broad general education. This is fine for many pupils. However, it runs directly into the face of the fact that for many pupils motivation to learn is proportional to the significance the learner sees of what he is learning to what he wants to do.

Many a pupil looks upon much of schooling as a delaying tactic to keep him from the chance to earn money whose spending he can control. For him entrance upon courses designed to prepare him for a particular job makes sense and he is willing to learn as a means to earn. Keeping this preparation opportunity available, while making the shifting of vocational objectives readily possible as the pupil gains in insight and maturity complicates vocational program planning, but it is important. It also strains the professional zeal of teachers first to help each pupil to see the significance of what he learns to its vocational usefulness and, secondly, to open the vision of other vocational possibilities to those who have the abilities to profit by moving out of a program which has limitations. Pupils who can profit by moving up and out of a program are often the ones with whom there is the greatest satisfaction in working and the ones whose performance is at the highest level. Thus it requires real professional service from a teacher to weed out these pupils as readily as he weeds out those who prove to be incapable of succeeding in the program.

"In our desire to plan a curriculum which will provide a wide academic base for the latter university education of professional men and women, we must remember that a vast majority of high school students have no intention of becoming engineers, scientists, etc. . . . Their vocations require a shorter period of formal training. If their interest in high school work is to be maintained, they must see the relation of their studies to their plans for later life. . . . For this purpose some portion of the eleventh and twelfth grades should be devoted to the practical courses.

— J. B. Conant

8. The changing role of women in the work force indicates the need for most vocational programs to re-assess the preparation of girls and to expand their opportunities for vocational preparation.

Industrial education is no longer the exclusive realm for boys. Trades and technical jobs are opening to women more and more. Few women now do not spend a portion of their lives in gainful employment. Their preparation for entry into jobs, and for many of them re-entry to work after child rearing, increasingly is becoming parallel to that for boys and men.

Houses are increasingly mechanized. Food processing increasingly simplifies the serving of meals. With the mother frequently the breadwinner when the father has no job, preparation for the vocation of homemaking and child care breaks down the former division of labor between father and mother. Home economics for girls who live in cities must change a great deal.

Requirements for Balance

So much, then, for a few observations about what the great cities face in preparing pupils for the world of work. Superintendents and board members in the large cities have also asked themselves "what are the requirements in our cities if the school system is to have a balanced program for preparing pupils for the world of work?"

They have gone far enough to agree upon seven specific requirements which are set forth in a policy statement on behalf of these cities. If the public school is to meet the responsibility of giving vocational education to youth of high school age, the school administration in large cities will find it necessary to:

1. See that aptitudes of pupils are identified through observations of what they do, through study of their records, and through testing.

2. Provide guidance that will encourage and cause pupils to enter suitable programs of study leading to occupations appropriate to their ability and their interest, and into occupations in which there is a reasonable expectation for their success, as well as those in which there will be a demand for new employees.

3. Provide the physical facilities and develop ways to teach youth the necessary skills and the related knowledge required for them to make at least a successful start on the job and, at the same time, provide the foundation for them to continue successfully with such in-service training as they may receive on the job or pursue on their own volition.

4. Secure teachers specially qualified by education and by work experience in the specialized job area to direct the preparation of boys and girls for the occupation and to relate this to the other parts of the school program which help the pupil to be an all-around good citizen.

5. Provide work situations, including co-operative work-school programs, for youth as a part of their vocational preparation, involving close relationships with employers, labor organizations, and public agencies.

6. Provide training for different job levels so that pupils would be able to prepare for a vocation requiring technical knowledge and job skill on the level of their mental capacity, their physical ability, and their other qualifications.

7. Provide for a continuous evaluation of all curricula offerings, including a follow-up evaluation of student success on the job.

General Propositions

As the Great Cities School Improvement Program continues, several points or propositions advanced by individuals at one time or another seem to be gaining in general support or recognition as more evidence accumulates. Let me note just a few:

1. Industrial education must be considered on a comprehensive basis. To restrict it to the programs reimbursed by the Federal vocational acts is to leave out essential areas of industrial education.

2. The *functions* of industrial education are more important than the organization plan through which the objectives are attained. There are good programs and poor programs under almost all forms of organization for industrial education.

3. *All* pupils in a school must be provided programs to prepare for entering the world of work. Those whose special job preparation will be in professional, college, or other post-high schools years, are just as surely preparing in high school for a vocation as those who take a job upon high school graduation. So is the boy or girl who goes only to the 10th or 11th grade and then takes a job. Selection processes which make available vocational programs only to the best pupils or which relegate only the poorest pupils to vocational programs cannot be defended.

The luxury of discarding from school the reluctant learner and the dropout as not being problems for the school, and expecting that these pupils will be absorbed in the labor force is no longer realistic.

4. Industrial education cannot be separate from or an appendage to the secondary school. It must be accepted that *all* education contributes to success in the world of work if we are to have balance to the education of a pupil.

So long as industrial educators consider themselves different and apart from other educators, and so long as all educators fail to recognize that their contribution to the preparation of pupils is equally important to vocational success with that of the teacher of a course labeled an industrial subject, children will be handicapped in receiving a balanced preparation for the world of work.

Preparing pupils for the world of work has always been a part of the responsibility of the schools. I hope that in this review I've been able to impress you to some degree with the special problems some school board members and superintendents see rest upon us in the "great cities." ◀

▶ Facilities for effective industrial education are probably as demanding as any school area . . . and here, in letter form, is a blueprint for a functional approach to planning —

Plant Programing in Industrial Education

STEPHEN CURTIS LITTLE and J. RICHARD McELHENY

Mr. Stephen C. Little
Associate
THE EDWIN T. REEDER ASSOCIATES
Miami, Florida

Dear Steve,

I wish to remind you of our discussions in Jacksonville last autumn when we attended the Junior High School Facilities Conference. The discussion centered about the necessity for careful planning and development of school facilities and in particular industrial education facilities.

We agreed then to enter upon a bilateral program that would produce plans for ideal or exemplary facilities. What preliminary information will you need in beginning this project?

Sincerely yours,
J. R. McELHENY

Dr. J. R. McElheny, Chairman
Industrial Education Department
University of Miami
Coral Gables, Florida

Dear Mac,

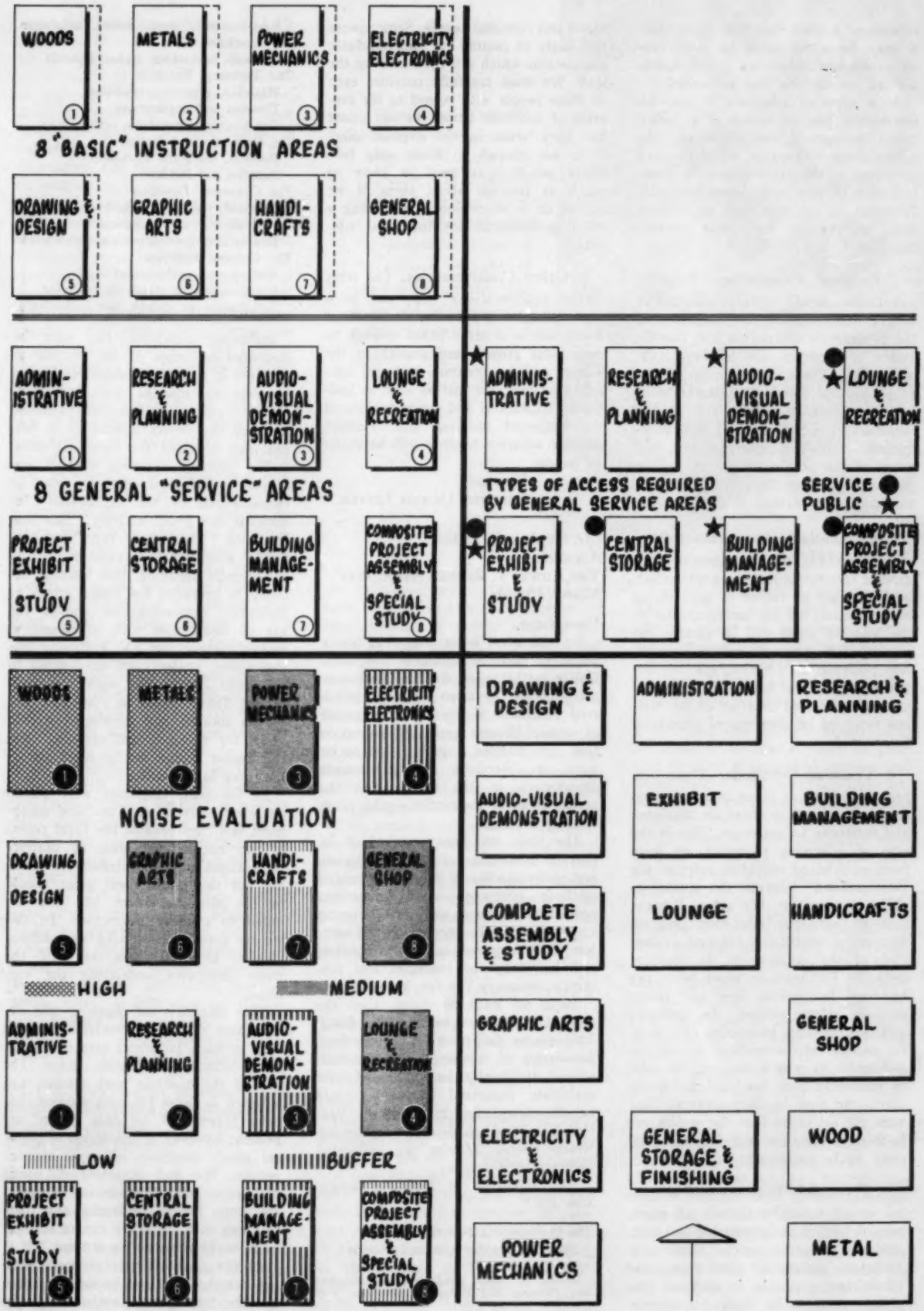
There is small chance, I'm sure, that either of us will soon forget the challenge so forcefully presented by the Junior High School Facilities Conference last autumn. One of our greatest concerns was over the not uncommon tendency to list a series of 'spaces — patterned after our present school buildings — and then to agree that the provision of such spaces constitutes the ideal facility! Appeals to cast aside these molds and dies and search for a genuinely better environment through collaborative work and discussion were met, with few exceptions, by an impenetrable wall of either lethargy or complacency.

So the old process continued of listing spaces and then amending and reamending this so-called "building program" to provide a door for one here and a counter for another there. And finally, the committee reports, in the main, restated the same labeled building requirements which have been with us for years.

People who have enjoyed the fruits of a more industrious approach to their school building programs apparently are not prone to talk much about them. There are probably plenty of reasons for this reticence, among them the modesty of the individuals themselves. Each of them has been part of a rare human experience. He has seen the dedication to principles, in which educators and architects take such pride, clearly demonstrated to be the best means by which to provide better education for our people and more effective, efficient, and economical buildings to serve this end. Those who attempt to tell of their experiences to others no doubt soon are discouraged by the same blank wall of silence experienced at the Jacksonville meeting.

Our mutual accord on the basic planning approach is what I hope may help us to achieve some success in planning ideal facilities for industrial teacher

Mr. Little is an architect with The Edwin T. Reeder Associates of Miami, Fla., and Dr. McElheny is chairman of the industrial education department at the University of Miami.


WOODS
METALS
POWER MECHANICS
ELECTRICITY ELECTRONICS
8 "BASIC" INSTRUCTION AREAS
DRAWING & DESIGN
GRAPHIC ARTS
HANDI-CRAFTS
GENERAL SHOP
ADMIN-ISTRATIVE
RESEARCH & PLANNING
AUDIO-VISUAL DEMON-STRATION
LOUNGE & RECREATION
8 GENERAL "SERVICE" AREAS
PROJECT EXHIBIT & STUDY
CENTRAL STORAGE
BUILDING MANAGE-MENT
COMPOSITE PROJECT ASSEMBLY & SPECIAL STUDY
TYPES OF ACCESS REQUIRED BY GENERAL SERVICE AREAS
SERVICE
PUBLIC
NOISE EVALUATION
HIGH
MEDIUM
LOW
BUFFER
DRAWING & DESIGN
ADMINISTRATION
RESEARCH & PLANNING
AUDIO-VISUAL DEMONSTRATION
EXHIBIT
BUILDING MANAGEMENT
COMPLETE ASSEMBLY & STUDY
LOUNGE
HANDICRAFTS
GRAPHIC ARTS
GENERAL SHOP
ELECTRICITY & ELECTRONICS
GENERAL STORAGE & FINISHING
WOOD
POWER MECHANICS
METAL

education. I trust that you agree that it may be worth while to state this bit of background to lay a foundation for the information that is needed.

As a point of reference, it may be worthwhile first to arrive at a rather broad outline of the scope of this information. Otherwise we may find ourselves in the same spot as a baseball team playing on an unmarked field. It seems to me that such an outline may include at least five general headings:

1. **Program Orientation.** Program orientation should, perhaps, include a general statement of the objectives of the program, a description and classification of students and teaching staff, and at least some discussion of known or anticipated collateral interests within the university family and in the community. Knowledge of the background, capabilities, potentialities, and goals of the people for whom we are planning our buildings is, of course, essential to the success of our planning.

2. **Curriculum.** An architect may only contribute minor suggestions regarding specific subject areas with which he is familiar by reason of his training or experience, but his understanding of the building needs will be greatly improved if he can "sit in" on curriculum planning. In addition, the curriculum will be one of our scales for measuring the required capacity of the various types of building spaces ultimately determined.

3. **Teaching Methods.** There are probably about as many innovations in teaching methods as there are teachers; and rightfully so, no doubt. This is the part of education to which we have frequently heard educators refer as the "battleground" whereon the student is either won or lost. We agree, I know, that an industrial education program warrants a careful and constant evaluation of the success of its teaching methods. Furthermore, much more can be done to develop new and better methods where needed. An architect will need to have knowledge of a careful analysis of the methods in practice and trends in new techniques. In order to efficiently plan teaching and study spaces, he must be thoroughly familiar with the activities that the spaces are to facilitate, and the material and equipment to be employed.

4. **Personnel.** Departmental personnel would naturally include all members of faculty, undergraduate and postgraduate assistants, special consultants, guidance, placement, production, and administrative people. In addition, provisions need to be made for maintenance and custodial people. Some spaces will likely be desired for undergraduate associations which are counseled by the staff. We must carefully consider each of these people with regard to his program of activities before we can orient his work areas in the over-all plan. It is not enough to know only how many people — we need to know as much as possible about them if we are to do a better job of providing a good environment for industrial education.

5. **Other Considerations.** The term "other considerations" may not be a very definitive choice, I'm afraid. What is needed is a term broad enough to encompass growth and change in the school and its program and yet adequate to designate factors such as budgetary limitations and considerations of the proposed building site. Perhaps another separate heading will be easier to handle.

Sincerely,
STEPHEN CURTIS LITTLE

Mr. Stephen C. Little
Associate
THE EDWIN T. REEDER ASSOCIATES
Miami, Florida

Dear Steve,

In your latest letter you asked me to define or describe industrial education. Unlike mathematics, the communicative arts, science, or other subjects, industrial education is actually a composite of several diverse areas of instruction that are bonded together by major goals or objectives. For this reason descriptions of the means, i.e., the actual areas of instruction, quite often confuse the issue.

The basic outcomes expected of industrial education are: an appreciation and understanding of modern industrial methods, guidance toward occupations needed by the community, a developing knowledge of consumer goods and services, and acquired manual dexterities and knowledge of machines and materials necessary for life in our times.

Since we learn by doing, then the student must learn industry by doing. This places design and planning first, knowledge of machines and materials second, and finally the molding of these materials. Industrial education should be the foundation upon which vocational training can flourish and through which people acquire an industrial-technical orientation.

The functions of industrial education are:[1]

The Occupational Function
  Opportunities for men and women
  Requirements, qualifications, education, experience
  Rewards, incentives, status, hazards
The Technical Function
  Materials, processes, machines
  Theories and applications
  Construction, operation, service
The Recreational Function
  Hobbies, the home workshop
  Supplies and facilities
The Consumer Function
  Selection, standards, function
  Use, safety, care, maintenance
  Evaluations: getting one's money's worth
The Cultural Function
  History and development
  Relationships to standards of living
  Significance to society, the individual

Industrial education can only be measured in terms of the success of students in orienting themselves in and learning to manage our industrial-technical culture, and should synthesize industry and reflect technology in laboratories provided for these activities.

The primary teaching method employed in industrial education may be characterized by the expressions "individual and group activity," "learning by doing," "laboratory type," or "dynamic educational experiences."

Generally speaking, this learning activity is preceded by either group or individual demonstrations and/or the use of visual aids such as filmstrips, motion pictures, or TV. Following this instruction, students are encouraged to plan and design the work that will follow. There should be a student center so located and developed it will serve for research and planning, and this center should be the most attractive area in the room.

In the past, emphases were placed on work stations and machine equipment and they became the focal points in the instructional area. In practice these items should contribute to learning but the prime focal point should be the planning center, the area devoted to primary instruction. In this we are actually expressing the philosophy of industrial education and the basic objectives underlying the curricula.

This emphasis on planning and design and related information can be seen in both industrial arts and vocational-technical instruction today. The day of the multiple work station, i.e., a bench or lathe for each student, has been superseded by this newer approach; however, in the design of physical plants emphasis on work stations remain. We find ourselves discussing philosophy and objectives and in almost the same breath beginning our plant planning with "so many square feet per each working station or student."

In the final analysis of space footage per student must become a factor, but the fundamental analysis must be

[1]Delmar W. Olson, *Technology and Industrial Arts* (Urbana, Ill.: College of Education, University of Illinois, 1958).

dependent upon implementation of objectives. The center of instruction must be the planning area, and the other areas should fit into the space analysis as adjuncts, teaching aides, auxiliary areas. I might add that storage space, usually thought of as "dead space" or superfluous to educational activity, may be equated with all other areas auxiliary to instruction.

Since these statements may appear to be radical and unrealistic, return to my discussion of philosophy and objectives and reconsider this current discussion. Each instructional area, wood, metal, graphic arts, drawing and design, electricity-electronics, power mechanics, and handicrafts, must be studied and interpreted in the light of the objectives or functions reported earlier.

The human factor enters the problem of facilities both as students, men and women, and as teachers. This immediately implies dual washroom facilities. In addition, the instructional area should assume the characteristics generally associated with a pleasant, relaxing atmosphere. Industrial psychologists and color specialists have already made great strides along this line. Although we should synthesize industry it does not follow that our instructional areas should symbolize some of the evils of industry, namely dreary, unpleasant surroundings.

I quite agree with you that attention should be given to student organizations and faculty groups. Also related to personnel should be areas reserved for exhibits of human efforts. These areas should be so placed as to dramatically tell the story of industrial education. Dynamic exhibits as well as static showcases might be considered — such as the placement of certain work areas that are visible to other students passing by.

I trust that I have begun to answer some of your questions. Industrial education is a provocative issue and needs sympathetic treatment by professionals as well as laymen. Today industrialization has spawned automation but the human factor is still with us, we are still producer and consumer.

Sincerely yours,
J. R. McElheny

Dr. J. R. McElheny, Chairman
Industrial Education Department
University of Miami
Coral Gables, Florida

Dear Mac,

Your last letter has helped considerably in clearing up many of my earlier questions.

Now we know something of your general objectives, the scope of your program, the teaching methods generally preferred, and the character of the people involved. In addition we have accumulated a fair amount of data dealing, in detail, with specific areas of the subject at hand. I am sure you understand how important this kind of knowledge is to a confident approach to the planning of facilities of any type.

As we go along into the planning of facilities it will probably be essential that we depart from correspondence and move into the conference method of approach.

I'm sending along some schematic breakdowns of the several different areas it appears we may want to consider. Let's get together where sketching materials are at hand, and start by studying the characteristics of these different areas and the desired relationships between them.

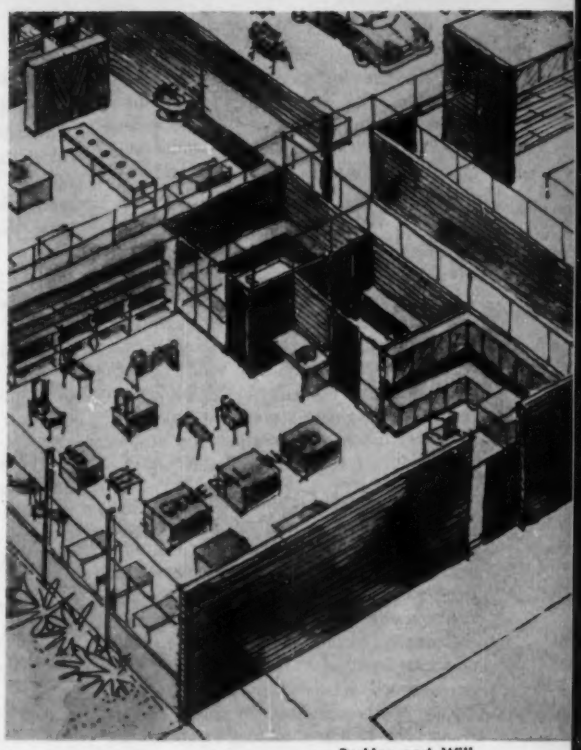
Sincerely,
Stephen Curtis Little

Dr. J. R. McElheny, Chairman
Industrial Education Department
University of Miami
Coral Gables, Florida

Dear Mac,

Our latest meeting seems to have developed some fruitful ideas. As we agreed, we are not too much concerned just now with the size or the arrangement of the instructional areas. Our main concern is to underscore the planning requirements for utmost flexibility in order to permit adequate freedom in implementing an instructional program in whatever direction it may be desired.

"Industrial education can only be measured in terms of the success of students in orienting themselves in and learning to manage our industrial-technical culture, and should synthesize industry and reflect technology in laboratories provided for the activities. . . ."



— Perkins and Will

Figures 1 through 4 are schematic diagrams that attempt to relate the several factors that have evolved from our correspondence and discussions. In the next several paragraphs I shall discuss some of the pertinent points that have come from our discussions.

Drawing and Design Areas. There are many advantages apparent in planning to provide individual drawing and design stations for each full-time student. Giving each student his own planning work center with space for equipment, reference material, and some personal belongings achieves the *planning-base* we both seem to feel is necessary.

With space adequate to allow for grouping of these drawing stations into class sections, the drawing and design laboratory may be readily effected. All study, drawing, and designing needed by the student may be accomplished here, thus negating any need for such facilities in the other instructional areas.

At this stage of planning, study of the general service areas must be concerned with activities and functions.

Administration. Administrative facilities need to afford space and a suitable environment for the administrative staff, the faculty, and for guidance and counseling. As our discussion moves along, it becomes increasingly apparent that this area should be arranged to implement close faculty teamwork as well as efficient administration.

Central faculty office facilities rather

than in the instructional areas seem advisable. This affords to the administration flexibility in class assignments, thus the instructional areas would require only suitable supervisory stations with perhaps some personal storage space for the assigned instructor.

Research and Planning Area. As we have envisioned the research and planning center this space will house a reference library and provide facilities for seminars, group research, and planning sessions for students and faculty alike. Space arrangement should allow for semipermanent storage of research data and materials assembled by study groups during the course of their work.

Audio-Visual, Demonstration Area. Adequate space for central audio-visual and demonstration can, with careful administration, avoid the waste resulting from a duplicity of such frequently inactive areas in each instructional area.

Properly equipped this space will offer the instructor an opportunity for much more effective teaching through lecture, demonstration, or audio-visual aides. The building manager should be qualified to administer the use of this space, to program its use, arrange demonstration material as needed, and of course be responsible for the operation and maintainance of all audio-visual equipment. More will be said about the building manager later.

The vacant periods in this area may be programed with the many educational motion pictures that have been developed by industries and educational institutions. Such an arrangement of educational films would attract many people to the industrial education facilities and serve in developing a fuller understanding of the magnitude and complexities of industry.

Student Lounge and Exhibit Areas. It is evident that we share the belief that such areas as corridors, lobbies, and exhibit areas may well be designed to adequately provide all lounge and recreation area necessary. The project exhibit and study area should be an informal area designed to permit display of completed projects and other exhibits of an educational nature.

Central Storage Area. The central storage area, as we have discussed it, seems essential to the efficient operation of a diversified program. It appears that no other means could provide effective control of the purchasing, storage, and issuing of the ever increasing scope of material, portable equipment, and special tools utilized in a vigorous program. The enlargement of this space to provide complete facilities for final finishing of projects may further strengthen the cost control as well as bringing about effective savings in ventilating and fire-control equipment.

Building Management Area. Our discussions about this area have indicated that the building manager should become another vital member of the instructional team and be concerned with the service areas as defined in Figure 1. Space will be needed for the administration and operation and smooth, effective, and continuous programing of the audio-visual center, for planning and assembly of project exhibits, and for scheduling and execution of maintenance and repair of the building and equipment in the instructional areas.

The primary responsibility for detailed planning and execution of laboratory rearrangements required to implement changes in instructional emphases or directions should also rest with the building manager. Space must also be be furnished to accommodate building cleaning services. It may be that some space should be required for instruction in the field of building management.

Project Assembly and Study Area. Our discussion of the area needed for composite project assembly and special study was especially stimulating to me. As you know, the building industry, among others, has moved steadily in the direction of increasingly complex assemblies of different materials. Much study is being given to the problems which stem from this trend, yet it can be expected that acceptable solutions to these problems will be found more rapidly if more minds can be brought to bear on them — especially minds well trained in objective evaluation and developed in the skills and technologies involved.

Such space designated by this classification has in the past apparently been apportioned a little here and there in several laboratory areas. In our concept, a more efficient and flexible plan would be found in such an area that could serve all of the divisions of industrial education. This and other innovations must be predicated on its use in industrial teacher education, whose level maturity would warrant the use. However, adaptations of these proposals might be made on the secondary level and surely at the adult level.

Space Analyses. As mentioned earlier, diagrammatic studies of the analyses of the 16 spaces may be seen in Figures 1 through 4. I have considered the instructional and service areas that are implied by your earlier letter. Also, the types of access to each have been considered, see Figure 2, and the relative levels of noise each may create, Figure 3.

There seems no reason at present to analyze the spaces in terms of specific sizes, finishes, equipment, etc. Further, the assumption that these facilities will be completely air-conditioned and artificially lighted tends to minimize the value of analyzing requirements for natural light, ventilation, and the like.

The control feature of the central storage area seems to imply that the instruction areas will be provided with external service access only through the central storage area. The term "public access" refers to direct external access only.

For simplicity we have graded the relative noise levels of the areas only in terms of high, medium, low, and buffers. The latter applying to areas housing activities which do not produce disturbing noise but which will not likely be disturbed by a moderate level of outside noise. For our purposes in preliminary programing this relative analysis should suffice.

The organizational chart found in Figure 4 illustrates the 16 areas arranged in three columns in a manner that begins to approach a space plan. The charting of these spaces illustrates an arrangement which we feel observes the considerations of access and acoustics and affords an internal relationship between the areas which would facilitate the smooth functioning of the program.

Our preliminary programing should probably not proceed further without answers to some of the earlier questions about enrollments, anticipated growth, budgetary, and site limitations. However, at this point we are prepared to go on into the detailed planning, determine building areas, and prepare budget estimates.

Sincerely,
STEPHEN CURTIS LITTLE

Mr. Administrator and Industrial Educator
Sometown, U.S.A.

Gentlemen,

This article has attempted to report bilateral action research in plant programing and to generalize the course of action that we feel should be pursued by teachers, administrators, and board members.

The solutions are not offered as a panacea but rather to provoke interest in this type of interaction between professional and lay people. Agreement or disagreement is encouraged, but surely not apathy.

The article falls short of representing the provocative and stimulating experience entailed in its development. However, it is hoped that a small portion will come through reading and will serve to guide others.

Sincerely,
STEPHEN CURTIS LITTLE
and
J. RICHARD MCELHENY

▶ A vital key to the effective industrial education program is its supervisor and here is a brief glimpse of his role and what should be his characteristics —

Role of the Industrial Education Supervisor in the Local School District

M. J. RULEY

The role of the industrial education supervisor is one of leadership for this area of the school curriculum with a joint responsibility for the over-all educational program of the school. The duties and responsibilities of such an assignment are similar to other department supervisors with the variations necessary to carry on a program of industrial arts and/or vocational industrial education.

A school philosophy emerges from group action. It should be the product of the critical thinking of many persons under optimum conditions of communication. Such a philosophy, to be effective, should be a personal conviction of all those concerned with the instructional program and a motivating force in all that is done for children and youth in the school.

From the concepts of democracy as a way of life which is concerned with the needs, interests, and welfare of man, and of the democratic process which places the burden on the individual working with others as a means of achieving this welfare, the purposes of education emerge. The acceptance of these purposes would obligate the school to provide experiences for the development of certain interests, knowledges, understandings, skills, and attitudes which are basic to the achievement of such purposes.

Characteristics of the Supervisors

The supervisor's first responsibility in implementing a philosophy of education, based on respect for the individual, is to practice such a philosophy in his relationship with co-workers.

To analyze how the supervisor implements the industrial education program, we might pose the following questions: What are the purposes of supervision? How does change in the quality of teaching take place? How can supervisors help bring about change? What are the personal and professional competencies of an effective supervisor? What are the specific responsibilities of supervisors to administrative personnel, including principals, to teachers, to the public, to each other?

In order that a good relationship may be established with administrators and others, the industrial education director, supervisor, department chairman, or teacher should possess certain characteristics that might be listed as follows:

He is well informed in his area of professional responsibility.

He is open-minded.

He is emotionally mature.

He is enthusiastic and resourceful.

He is skillful in promoting good school-community relations.

He is loyal.

He is effective in oral and written communication.

He has the physical health and energy required for assuming his responsibilities.

He practices good human relationships.

He recognizes supervision as educational leadership.

He knows his job and does it.

He knows his administration and works co-operatively in this relationship.

He makes his department an integral part of the school.

He knows and follows school administrative policies.

He keeps his administrator informed as to what he plans to do and what he has done.

He gives credit when credit is due.

He is an active citizen of the community.

He is an effective public-relations contact for the entire school.

With these characteristics, there should develop the degree of mutual understanding, respect, and friendship necessary for effective personal and professional relationships with administrators.

The purpose of supervision is to help school personnel to change in such a way that they will provide a better program of education. Change may be needed in philosophy, in content or emphasis, in procedures and techniques, in classroom organization and management, in ways of working.

The structure of our present program of industrial education is sound; it needs to be upgraded, given depth and breadth, depending upon the need in a given situation. We are not teaching all of the things we have outlined in most of our teacher guides or course outlines (guidance, correlation with other subjects, relationships with industrial processes and materials). ◀

Mr. Ruley is the supervisor of industrial arts and vocational education, Tulsa, Okla., Public Schools.

— Ohio State Department of Instruction

The industrial educator must know his subject in depth and he must be a skilled teacher. . . . To supply the administrator with a guide to selecting this craftsman-instructor, here is a suggested yardstick —

Selecting Industrial Education Teachers

J. W. GIACHINO

School superintendents and boards of education are perenially faced with the problem of employing new teachers. Frequently the question is asked: "Are there any reliable measuring devices which can reasonably predict teaching success with any degree of certainty?" Unfortunately the answer is no, but this does not mitigate the need to develop and employ more realistic selection procedures. Categorically, the selection of the right people for the right job is a very important responsibility of any administrator, because an organization is only as effective as the people who function within it. This is true whether it be industry, school, business, or government. It is particularly important in a school system where teachers wield such tremendous influences on the educational development of our youngsters. Yet there is reason to believe that in too many instances teachers are chosen by haphazard methods, with personal judgment as the exclusive dominating selection factor.

Dr. Giachino is head of industrial technology, Western Michigan University at Kalamazoo.

Authorities generally agree that subjective evaluation is not always the most reliable criterion for passing judgment, especially if it concerns people. There are some tests, if properly administered and interpreted, that will provide significant information about an individual. Certain achievement, intelligence, aptitude, and personality tests do have a degree of validity, but these tests will only disclose general potentials of a person. Mere indication of potentials, however, is no guarantee that they will materialize; nor is it safe to conclude that test results are infallible and reliable predictors of job success. Perhaps 50 or 100 years from now it may be possible to feed into an electronic computer specific data which the machine will analyze, and then produce an accurate and irrevocable appraisal of an applicant's ability to do a specific job. In the meantime, without an absolute yardstick, the determination of an individual's competency must continue to be based on the best available evidence, and the facts subjected to some form of relative measurement. It is possible to minimize the hazards of relative measurement if the evaluation is made in terms of a set of standards which characterizes essential job requirements.

A number of years ago the writer attempted to identify the qualities which could be used as a standard in selecting competent teachers of industrial education.[1] No attempt was made to weigh these qualities but merely to associate or disassociate them with actual teaching success. Some of the more

[1] J. W. Giachino, "An Analysis of the Success Qualities That Should Be Emphasized in the Training of Candidates to Become Competent Teachers of Industrial Education." Unpublished Ed.D. dissertation, Pennsylvania State University, 1949.

(Continued on page 68)

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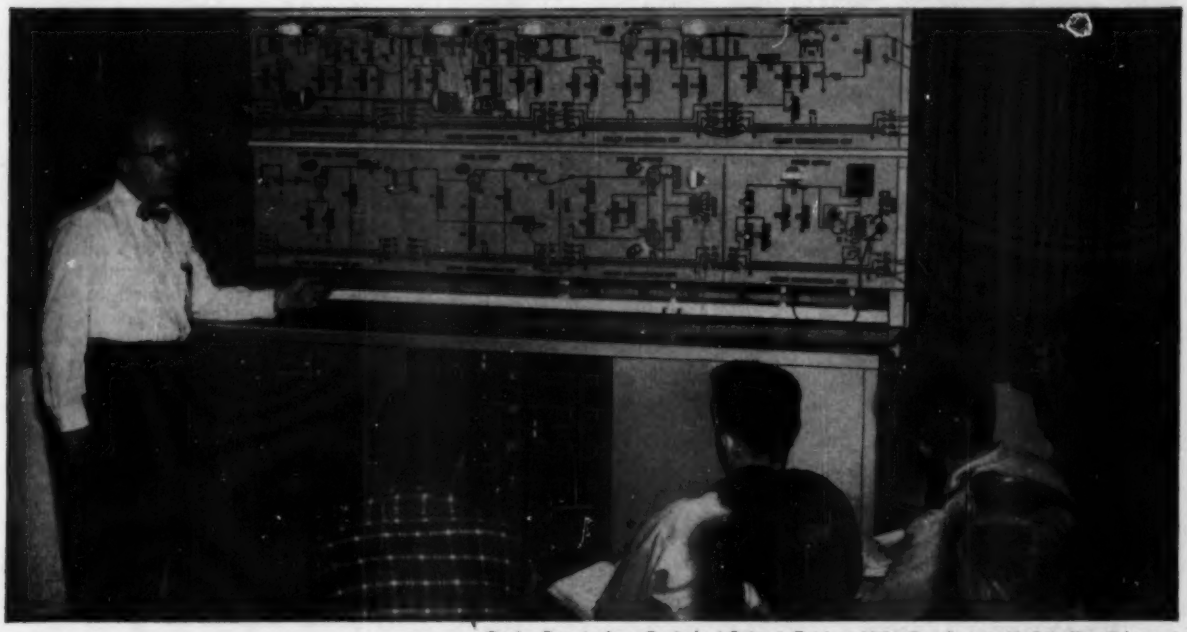

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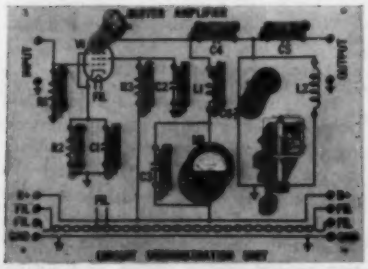

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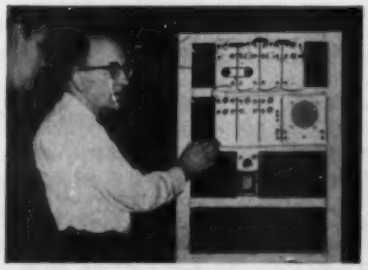

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SELECTING TEACHERS

(Continued from page 66)

specific success qualities which were identified are presented here with the view that they may be of benefit to a superintendent or school board in developing a set of job selection standards. If these qualities are used in designing a selection or rating instrument, certain values will have to be attached to the selected qualities. These values should reflect the judgment of the superintendent and the school board as to what they consider to be of primary and secondary importance for the school district concerned. The implementation of the rating device then can be achieved by (1) personal interview of the candidate, (2) appraisal of references from educational institutions, (3) examination of the applicant's scholastic record, and (4) administering recognized standardized tests. Here are the qualities which seem to have a direct relationship to success in teaching industrial education. Conceivably many of the same qualities would be applicable in selecting teachers for other educational areas.

Physical Qualities

Physical qualities encompass such factors as health, freedom from physical defects, undesirable mannerisms, voice quality, and general appearance. These qualities can be checked quite objectively. Thus, a candidate should be expected to pass a physical examination inasmuch as the health of a teacher is important to insure the necessary energy and vitality to meet the full demands of his position. A teacher with a history of frequent absences may be a risk, first, because it creates the problem of having to find a suitable substitute constantly, and second, because absences always jeopardize a continuity of educational experiences.

Physical defects should not be viewed too critically unless there is a strong possibility that they may restrict the teacher from carrying out his teaching duties or may be sufficiently distracting to affect adversely the learning process of the students. A personal interview should readily disclose if physical defects are objectionable. Undesirable mannerisms can also be ascertained during the interview session. Distracting bodily movements are annoyances which if not corrected may materially hinder the effectiveness of a teacher. Voice quality very definitely should be given serious attention while interviewing the candidate. In the final analysis voice is one of the chief "tools" of teaching. The difference between a strong, pleasing, convincing tone and a rasping, weak, and disturbing tone is often the qualifying factor between a good and poor teacher. Nothing is more demoralizing than the teacher whose voice does not carry, or who speaks in such a monotonous tone as to put his listeners to sleep. Finally, the general appearance of the candidate must be considered. A notation should be made of such items as dress, cleanliness, and posture. A teacher needs to portray all of the attributes and mores of healthful living.

Mental Equipment

Mental equipment involves the intelligence, alertness, and judgment of the teacher. A teacher is expected to have better than average intelligence, because without it he functions in a realm of mediocrity. But superior native intelligence is not enough. With it there must be the alertness, the imagination which stimulates students to achieve educational progress, and the sound judgment that indicates good common sense. The superintendent will need to rely on the people who have worked with the candidate in educational institutions for an appraisal of these qualities. A rating scale should disclose reasonably high values to items which measure the mental equipment of prospective teachers.

Habits of Work

There are many qualities which reflect an individual's work behavior pattern. Those that seem to have a high correlation with success in teaching industrial education are:

1. Initiative, originating and carrying out ideas;
2. Enthusiasm, lives his subject, inspiring, zestful;
3. Adaptability, versatile, readily changes plans to meet new situations, progressive;
4. Acceptance of responsibility, assumes responsibility willingly;
5. Punctuality, fulfills obligations on time;
6. Dependability, does not forget, gets things done, reliable; and
7. Efficiency, does things correctly, effectively.

In appraising a candidate for a teaching position, these qualities will have to be judged on recommendations submitted by teacher trainers who have worked closely with the individual and who have observed him over a period of years.

Emotional Qualities

The qualities under this heading are frequently referred to as traits reflecting a teacher's personality or his ability to get along with students and his associates. It is often said that the personality of a teacher has the deepest and the most far reaching impression on the mobile minds of students. If this is accepted as a valid premise then it would be foolhardy to overlook

(Concluded on page 70)

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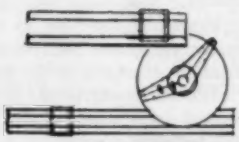

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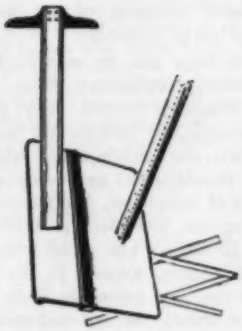

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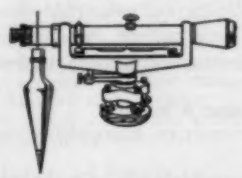

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SELECTING TEACHERS

(Concluded from page 68)

the factors that have such an impact on the growth of students. Evidence seems to indicate that the following qualities exert the greatest influence:

1. Self-control, patient, tolerant, kind;
2. Friendliness, cheerful, pleasant;
3. Sense of humor, ability to take a joke, see the humor in a situation;
4. Loyalty, loyal to students, fellow workers and supervisors;
5. Sincerity, honest, frank;
6. Tact, saying the right thing at the right time; and
7. Fairmindedness, impartial, gives all a square deal, sense of justice.

To what degree a candidate possesses these traits cannot be determined by means of an interview or application of tests. They are discernible only through observation over an extended period of time. A superintendent must, therefore, accept the judgments rendered by teacher trainers who have had close and intimate contacts with the applicant. Needless to say a rating scale must indicate a high regard for emotional characteristics, since it would be a serious mistake to have a member on the staff who was not respected. Students will often overlook a strict and demanding teacher, but rarely will they have any admiration for one who explodes on the slightest provocation, or who fails to conduct himself in a tactful, friendly manner and with a sense of understanding and tolerance.

The field of industrial education makes it mandatory that teachers have an extensive background of technical knowledge and technical skills. This is true whether the teacher is involved in teaching industrial arts or trade and industrial courses. Not only must a teacher know his subject, but he needs to have a reasonably broad understanding of the humanities, social sciences, and particularly mathematics, physics, and chemistry.

The technological structure of industry today can no longer tolerate industrial education teachers with only a shallow, artificial background. Just as all educational areas must provide more meaningful learning experiences to students, so, too, must industrial education insure that its courses have greater substance and quality. Only if teachers have a sound mastery of their subject can they be expected to meet the full technological demands of our modern industrial social structure.

Several ways can be used to check an applicant's proficiency. First, there is his scholastic record. His grades should reveal how well he has learned. In addition, the sequences and types of courses should give some clue as to his depth of knowledge. Another method of finding out how well he knows his field, is to subject him to an interrogation by unbiased experts in the field. Perhaps the best procedure is to have him take several written and practical examinations. In any event, some concerted scheme should be used to evaluate the candidate's technical knowledge and skill.

The final segment of an evaluation plan must give some consideration to the candidate's ability to teach. Obviously, experience is the prime factor in getting a person to mature into a skillful teacher. Nevertheless, even the beginning teacher must have acquired certain basic teaching competencies, otherwise students must unnecessarily be exposed to poor teaching for too long a period.

In general, these are the teaching skills that are required to achieve success in conducting industrial education classes. These include the abilities to:

1. Stimulate and develop student interest;
2. Present a lesson;
3. Demonstrate manipulative operations;
4. Use problem-solving techniques;
5. Evaluate students;
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7. Handle disciplinary problems;
8. Counsel students; and
9. Organize instructional material.

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NEW BOOKS

(Concluded from page 16)

industry that provide training for students whose background is limited to a high school education, including two years of mathematics.

The first ten chapters comprising Part I come under the heading "Characteristics of Unidirectional Circuits"; the nine chapters in Part II under the heading "Characteristics of Sinusoidal Circuits," and the final five chapers under the title "Characteristics of Complex Waveform Circuits." The book includes an appendix and a bibliography.

Handcrafts Simplified

By Martha Ruth Amon and Ruth Rawson. Cloth, 210 pp., 10¼ by 7¾ in., illus., $4.40; paper bound, $2.80. McKnight & McKnight Publishing Company, Bloomington, Ill.

The material on sixteen major crafts is presented, both for the novice, and as a guide for the teacher and seasoned craftsman. Especially good for anyone who wishes to create original designs. Step-by-step instructions and 368 illustrations show exactly how to proceed. Information on the proper use of tools and application of each medium is up to date, and a convenient list of "sources of supplies" is offered in the back of the book. The book includes information on appliqué; batik; block printing; ceramics; enameling on metal; hooked rugs; jewelry; leatherwork; papier-mâché; quilting and trapunto; stenciling on cloth, paper, wood, or metal; stitchery; tie-dyeing; weaving; decorating woodenware; reed and raffia.

Household Equipment

By Louise J. Peet and Lenore S. Thye. Cloth, 357 pp., 6 by 9¼ in., illus. John Wiley & Sons, New York 16, N. Y.

In this Fifth Edition, the present or future homemaker is provided with data on: the selection of equipment best suited to her needs within the limits of her money resources; using such equipment advantageously and caring for it so that it will give continued satisfaction for years; improving arrangement and storage facilities for equipment, to assist in motion and energy saving; a list of manufacturers and associations; air conditioning of the home; certain technical topics such as lighting, heating, insulation, electricity, and characteristics of synthetics; and materials used for floor coverings.

Creative Paper Design

By Ernst Rottger. Cloth, 95 pp., 8¼ by 8¼ in., illus., $4. Reinhold Publishing Corp., New York 22, N. Y.

A workbook for teachers and students, professional and amateur artists. This is the first volume in a "creative play" series, that will appeal to every person who has discovered that creative ingenuity is the best counterbalance to the functional and utilitarian limitations put upon the thinking of our time. This book contains numerous examples of how paper can be cut, pieced, pasted, folded, and interwoven into interesting forms and objects.

The Nature of Science

By David Greenwood. Cloth, 95 pp., 4¼ by 7½ in., $3.75. Philosophical Library, New York, N. Y.

Not intended for universal readership, this collection of five essays is for those who, at the least, have substantial knowledge of and interest in the sciences.

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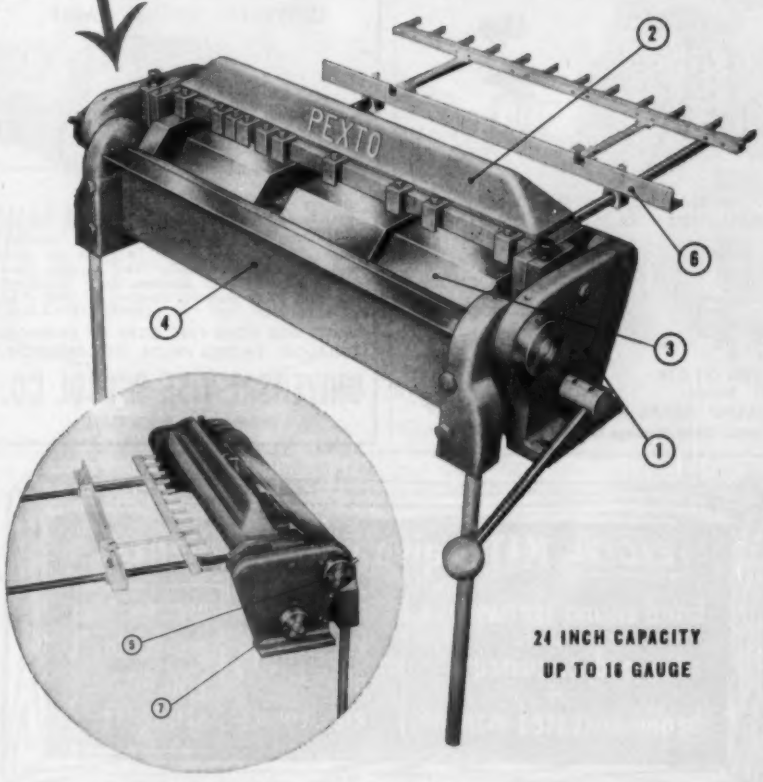

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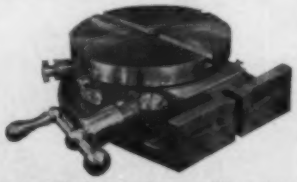

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NEWS

(Concluded from page 10)

and Drafting Rooms in the Production of Projects or Jobs." In the afternoon sectional meetings were held for machine shop teachers and for drafting teachers, with emphasis on instructional aids.

I-A symposium The Division of Industrial Arts of The City College School of Education, New York City, conducted a symposium on Friday, April 21, at 7:30 p.m. The theme of it was "Industry in the Industrial Arts Curriculum." Dr. Julius Paster, assistant professor of education, The City College, was chairman of the event, and addressed the meeting on "Industrial Arts — A Consensus." Keynote Speaker Dr. William P. Bears, professor of education, New York University, spoke on "Industrial Arts and the World Around Us." Panel Participants were Dr. George R. Keane, John Nidzgorski, Dr. Bernard Rappaport, and Herbert Siegel. The subjects covered by each participant respectively: "Production — The Art of Industry," "Teaching Industry in Suburban Schools," "Teaching Industry — The Teacher," and "Teaching Industry — Supervision and Administration."

Kansas I-A teacher education council On January 19, 1961, the heads of the industrial arts departments from the colleges and universities who teach industrial arts, met at McPherson College in Kansas, to form a state organization called Kansas Industrial Arts Teacher Education Council. Its purpose is to promote industrial arts in the State, and to share the problems of fellow teachers, and to become better able to present a united front in the cause of industrial arts education. A second meeting of the group was scheduled to be held at Wichita University on April 22.

student project fair The tenth annual Student Project Fair and Convention of the North Carolina Industrial Arts Association will be held at Sedgefield Junior High School, Charlotte, on May 5 and 6. Programs for industrial arts instructors, students, and guests are being planned. These include commercial exhibits, project exhibits, visits to schools, tour of Douglas Aircraft Plant, the banquet, and business meetings. Carroll W. Smith, associate professor of industrial arts, East Carolina College, is president of the N.C.I.A.A.

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MOTION PICTURES

The films below are available for showings to students or community groups. Each dramatically portrays some of the problems that confront today's high school youth. To arrange showings, check the box next to title you desire.

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☐ **Point of View.** Parent-oriented film suitable for PTA showings. Black and white, 30 minutes.

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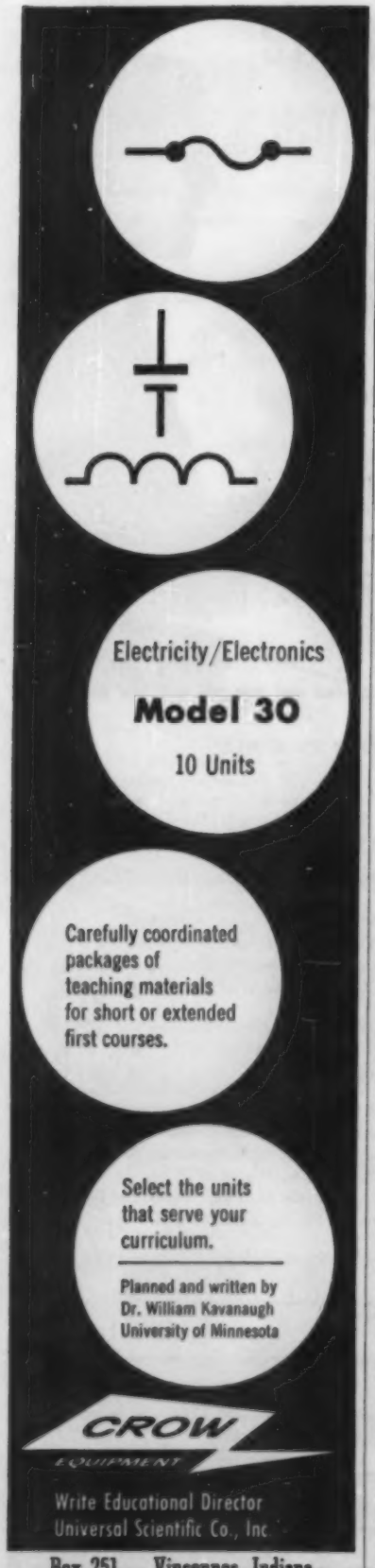
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CONNECTICUT INDUSTRIAL ARTS ASSOCIATION

On May 5 and 6, 1961, the Connecticut Industrial Arts Association will hold its 28th Annual Spring Conference at Central Connecticut State College, New Britain, Conn.

Dr. William J. Micheels, professor and chairman, industrial education department, University of Minnesota, Minneapolis, will give the main address at the Friday banquet, and will discuss the topic "Development of Technical Education in Indonesia."

Other highlights of the conference will be the Student Craftsmans Fair, an industrial tour on Friday morning, luncheon and symposium on Friday, demonstrations, and meetings with commercial exhibitors.

OREGON INDUSTRIAL ARTS ASSOCIATION

At the annual spring convention of the Oregon Industrial Arts Association, held March 16 and 17 at Portland, the following officers were elected: president — David Turnbull, Hillsboro; vice-president — Vern Voss, Medford; secretary — Robert Newell, Portland; treasurer — Robert White, Hillsboro; to the executive board — William Shulz, Prospect.

Robert Johnson, and John Shefler, both of Portland, will continue to serve on the executive board, as will William Oleson, Beaverton, who is Relay Editor, OIAA State Representative.

Chet Seavy, Pacific Telephone Northwest, who was the banquet speaker, discussed the advancements in electronics within the telephone industry.

TEXAS INDUSTRIAL ARTS ASSOCIATION

The 1961 meeting of the Texas Industrial Arts Association was held on the campus of Texas A & M College, College Station, on February 24–25.

Dr. M. Ray Karnes, professor of higher education, College of Education, University of Illinois, Urbana, and immediate past president of the American Industrial Arts Association, was the convention consultant. Dr. Karnes made two presentations: "This Is Industrial Arts," and "Industrial Arts in the Years Ahead."

Prior to the sectional meetings, Dr. Lee Wilborn, assistant commissioner for instruction, Texas Education Agency, Austin, gave an address on "The Role of Industrial Arts in Texas Schools." Following this presentation the following sectional programs were presented: (1) Modern Materials and Techniques in Wood Finishing; chairman: C. C. Davis, associate professor of industrial arts, North Texas State College, Denton; (2) Teaching Pre-Engineering Drawing and Descriptive Geometry at High School Level; chariman: Luby Le Norman, Jr., industrial arts department of West Columbia-Brazoria Public Schools, West Columbia; (3) The Utilization of the Polyethylene Resins in Industrial Arts; chairman: Bragg Stockton, consultant for industrial arts, Independent School District, Dallas; (4) Utilizing New Materials and Techniques in the Teaching of Crafts; chairman: R. F. McEowen, assistant professor of industrial arts, Texas A & I College, Kingsville; (5) Utilizing New Materials and Methods in Teaching the Graphic Arts; chairman: Charles E. Woodson, industrial education at East Texas State College, Commerce; (6) Organizing

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and Promoting Industrial Arts Clubs at Secondary Level; presiding: W. A. Mayfield, industrial arts at Snyder Independent School District; (7) Problems and Issues in Teacher Preparation in Industrial Arts; chairman: Dr. Stephen Randel, director of industrial arts, Sam Houston State College, Huntsville.

Officers to serve the association for 1961–62 are: president — Billy Mayes; vice-president — Benton Brockette; secretary-treasurer — Frank Miller; executive-secretary, John R. Ballard.

NEW JERSEY VOCATIONAL AND ARTS EDUCATION ASSOCIATION

The forty-third annual convention of the New Jersey Vocational and Arts Education Association was held in Asbury Park, March 9 to 11. The theme of the convention was "Quality Education for the 60's."

The speakers at the general and sectional meetings amplified the importance of vocational and arts education in today's curriculum. These speakers repeated the feeling that a school program that decries the emphasis on practical and industrial arts and other so-called special subjects is unbalanced.

New officers for the year are: president — Willard Vroom, Trenton Central High Vocational Printing Instructor; first vice-president — Dr. Burr D. Coe, director, Middlesex County Vocational and Technical High School; second vice-president — Rosalie C. Risinger, Principal of Essex County Vocational and Technical High School; third vice-president — William M. Devonald, Newark Schools Director of Industrial Arts; secretary — Richard O. Harthmann, Jersey City industrial arts supervisor; and treasurer — Edmund A. Boyer, Jr., instructor of industrial arts at Merchantville High School.

SHEBOYGAN (WIS.) I.A. ASSOCIATION

The Sheboygan Industrial Arts Association conducted an area workshop on Saturday, April 29, 1961, at the new South High School. The program, prepared for the industrial arts teachers and vocational directors and instructors in the East-Central Wisconsin area, allowed time for tours of the building. In order to promote professional improvement and gather an insight into a pressing problem, the workshop was formulated. This activity is also meant to encourage similar action on an annual basis.

The theme of the program was "Industrial Education Meets Industries' Requirements, Yes or No?"

AMERICAN WELDING SOCIETY

The American Welding Society held its 42nd Annual Convention and Welding Exposition, and were hosts to the International Institute of Welding, in New York, April 10 to 21. The I.I.W. met April 10 to 15 at its headquarters hotel, the Sheraton-Atlantic, and remained for the AWS Meeting and Welding Show. AWS Technical Meetings were conducted in the Commodore Hotel, and the Welding Show in the New York Coliseum, April 18 to 20.

COMING CONVENTIONS

Apr. 28–29. Colorado Industrial Arts Association, at Campus of Colorado State College, Greeley, Colo. Secretary, James A. Huth, 2309 Mt. Vernon, Colorado Springs, Colo.

June 12–16. Colorado Vocational Association, at Colorado State University, Fort Collins, Colo. Exhibit chairman, Herbert L. Benson, Colorado State University, Fort Collins, Colo.

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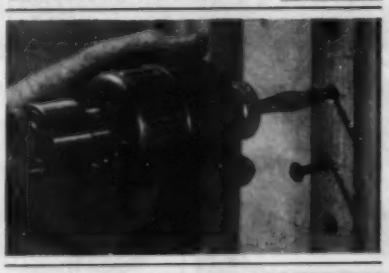

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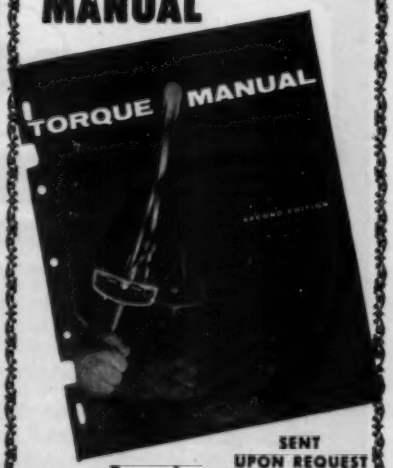

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NOTEBOOK

(Concluded from page 14)

pends upon whether you are going to want to move them from one location to another; whether you wish to remove the entire machine from the desk for storing; or whether you want your students to use separate boards to slide into place under the device.

In our case, we use the top of the drawing desks, with a piece of light colored card board over the entire 28 by 36 in. desk top anchored with drafting tape. The machine is clamped to the desk top about midway up the top edge. This gives access to the entire desk top. Drawings are held with tape to the cardboard, being removed at the end of each class. The tape can be used again. A base line is drawn on the top cover for checking the machine and for lining up the drawing quickly.

The drafting machine consists of three basic elements: a parallel arm, an adjustable protractor head, and a pair of scales attached to the protractor head, one horizontally and the other vertically. The parallel-motion arm consists of two sections, an upper and a lower section. The free end of the upper section attaches by screws are clamps to the upper edge of the desk or drawing board. Each arm section consists of two aluminum pulleys connected by a long loop of steel tape held under tension by the arm frame.

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The tensed steel tapes maintain the angular relationship of the pulleys so that the protractor head is held in constant angular relationship to the drafting board. Hence, the scales which are attached to the protractor head are carried so as to remain parallel to the base line automatically, requiring no thought or effort on the part of the operator. The use of two scales achieves the required horizontal and vertical reference formerly obtained from the T square and triangle.

In addition to a reference direction, drafting requires dimensional reference. Since the T square and triangle are directional only, a separate scale for measuring dimensions is needed. On the drafting machine the ruling edges can be graduated directly because the scale "zero" can be readily placed at any desired point. This ability to place the scale so as to give simultaneous directional and dimensional reference is the key to the rapid drawing which the drafting machine makes possible. Scales are removable and interchangeable, hence different scales may be used to fit the type of work at hand.

In angular work, the drafting machine is indeed a time saver. All "standard" angles in multiples of 15 deg. can quickly and easily be set by means of the automatic indexing mechanism in the protractor head. All other intermediate angles can be used quickly by the use of the graduated dial and vernier clamp.

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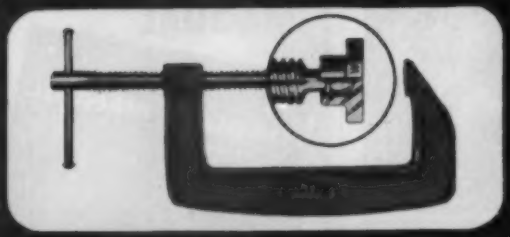

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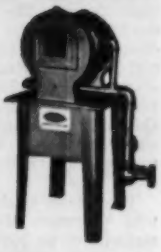

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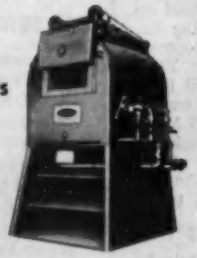

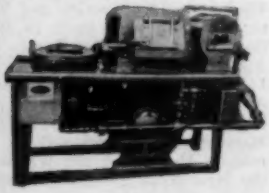

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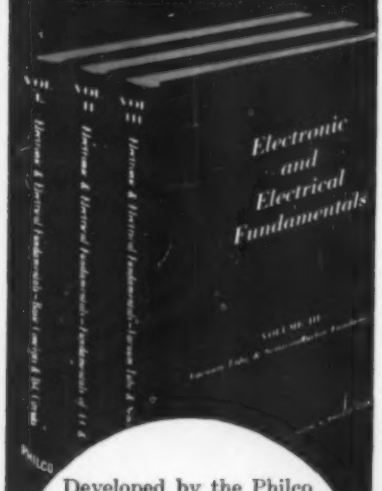

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personal

deaths . . .

▸ *Clinton R. Kock,* industrial arts teacher at Henry Clay School at Whitefish Bay, Wis., died recently at the age of 43. He had been on the faculty at Henry Clay for the past five years. Before that he was principal of Bergland High and Elementary School, Bergland, Mich.

awards . . .

▸ *Richard J. Hoffman,* professor of industrial arts and printing management at Los Angeles State College, has been presented the Elmer G. Voight Award "for exemplary service in the field of graphic arts education."

The presentation was made by Dwight Gick, president of the Los Angeles Chapter of the International Association of Printing House Craftsmen, at their February meeting at the Rodger Young Auditorium.

Mr. Hoffman has built his national reputation, primarily as a typographer, through study and practice in the printing fields. His start in printing dates back to 1925, and now at 48, he is a leading authority on printing.

appointments . . .

▸ *Dr. Marvin Poyser,* former head of the industrial arts department at North Dakota State, has resigned his position to accept an associate professorship in industrial arts education at the University of Hawaii.

▸ *J. Philip Bromley,* California State Polytechnic College instructor, has been assigned to full-time duties with the college's Special Educational Services functions. He will direct the curriculum co-ordination program between Cal Poly and the state's junior colleges. Because approximately one half of the new incoming students transfer to Cal Poly from junior colleges, the college has initiated the program to facilitate the transfer of the junior college student to Cal Poly's campuses located at San Luis Obispo and Pamona.

Mr. Bromley has been an instructor in the farm management department for the past four years. Prior to that time, he taught in the social science department. During his 13 years at Cal Poly, he has served on many faculty committees, and acted as adviser to a number of student groups.

In his new position Mr. Bromley will aid Harold O. Wilson, Dean of Educational Services and Curriculum Development.

▸ *Dr. Berry E. Morton,* professor of industrial education at Indiana State Teachers College, Terre Haute, Ind., is on sabbatical leave this semester, visiting other industrial education departments throughout the country.

retirements . . .

▸ *Oren T. Casey,* an instructor of industrial arts for many years, retired recently from his position at Mentor, Ohio, High School.

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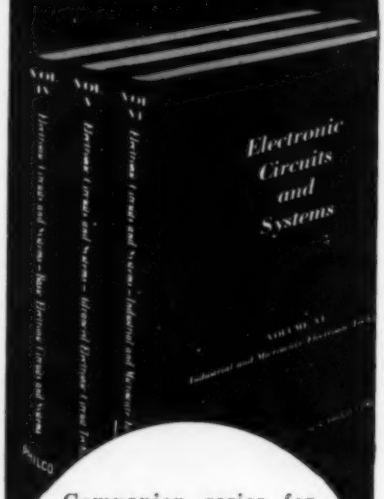

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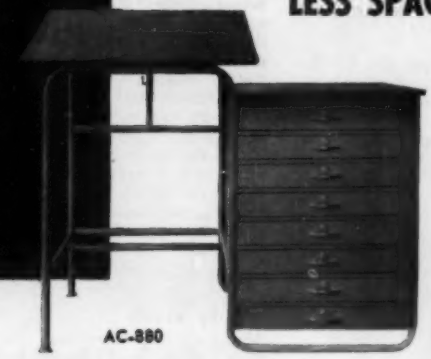

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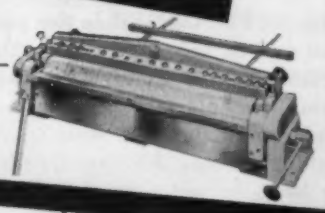

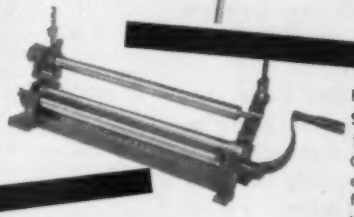

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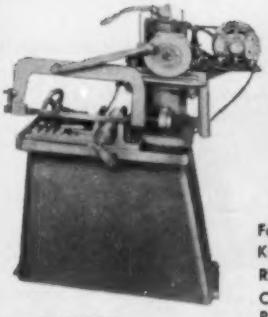

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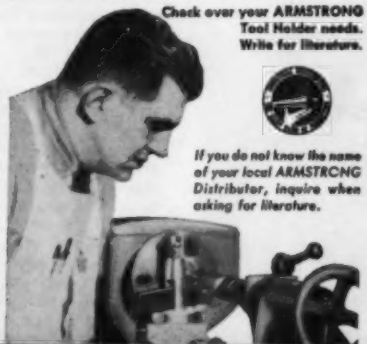

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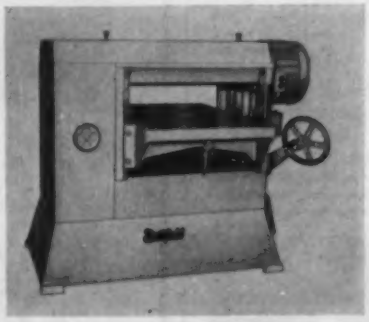
machine comprises a basic double column Hy-Flex Mill with hydraulic longitudinal table feed, horizontal spindle, and dovetail overarm. The opposed double column V ways provide exceptional support for the massive knee, and the dovetail overarm is securely anchored to both stud columns, which have finished machined tops approximately 12½ in. square. In addition to single spindle milling, the versatile Hy-Flex Mill is designed to accommodate two or more independent milling or grinding heads positioned to the user's requirements — leading or opposed, in line, or tilted above or below horizontal plane. Thus, special machine performance at minimum investment is afforded by U. S. Burke's wide selection of versatile standard milling components with a range of capacities. Detailed information and descriptive literature may be obtained from the manufacturer.

(For further details encircle index code 0501)

planer-surfacer From The Northfield Foundry & Machine Company, their new No. 7 Planer-Surfacer, designed and built for the most demanding and varied needs of today's production and educational woodworking. It will plane material 25 in. wide and from 1/16 to 8¼ in. in thickness.



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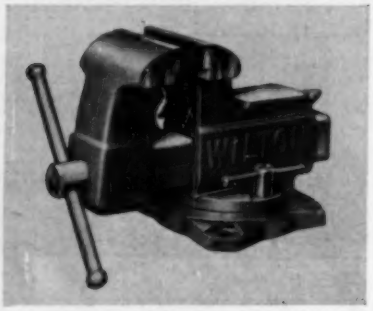
Cutterhead design allows a maximum cut of ½ in. Butted pieces as short as 4 in. and single pieces 12 in. may be planed. The machine is available in either a direct motor or vee-belt drive with 5-, 7½-, 10-, or 15-h.p., TEFC motors. Direct motor drives operate at 3600 r.p.m. Vee-belt drives operate at 5000 r.p.m., or to customers' orders. A four-knife cutterhead of high carbon steel is 25 in. long and has a 4½-in. cutting circle. A large box-type, three-point, mounted base of streamlined design insures proper support of all components, and a heavy, one-piece table accurately carries all table parts for precision planing and is easily adjusted with a hand wheel. For more details write to the manufacturer.

(For further details encircle index code 0502)

utility vises From the Wilton Tool Manufacturing Company, the new "640 Line" utility vises designed for rugged use, consisting of two sizes designated as No. 643½ and 645. The 643½ has a jaw width of 3½ inches, a maximum opening of 4 inches, and a jaw depth of 3 inches. The pipe capacity ranges from ⅛ inch to 2 inches, shipping weight 19 pounds. The 645



"640 Line" Utility Vises

has a jaw width of 5 inches, a maximum opening of 5½ inches, and a jaw depth of 3¾ inches. The pipe capacity is ⅛ to 2½ inches, shipping weight 34 pounds. Made of hardened steel the pipe jaws are replaceable, as also the serrated steel top jaws. These vises have a large reinforced forming horn and an unbreakable 3/16-inch formed steel slide. This is a completely new product line designed with the latest available engineering know-how. For greater detail please write to the manufacturer.

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drill presses From Boice-Crane Company, the Swedish-built geared-head drill presses in 18- and 24-in. sizes, in addition to a third size — 25½ in. — with capacity to 1¼-in. hole in cast iron, 1½ in., in steel, with additional heavy-duty characteristics of a 2-speed motor 2½ h.p., at 1725 r.p.m.; and No. 4 M.T. spindle socket, 5½-in. diameter column, 6-in. maximum spindle travel, 3-feed rates — .004 in., .008 in., and .012 in. per revolution — with oil pump; gears running in oil. Eight spindle speeds, instantly available by gearshift and 2-speed motor switch, are 60, 120, 180, 300, 360, 450, 600, and 900 r.p.m's. Other features are: clearances from spindle nose — 25¾ in. to table, 39½ in. to base; both the 15¾ by 15¾-in. worktable and base have ground working surface, T-slots, and coolant trough. A second optional worktable with oil trough only, no T-slots, measures 20 by 25 in. Standard worktable

(Continued on page 82)

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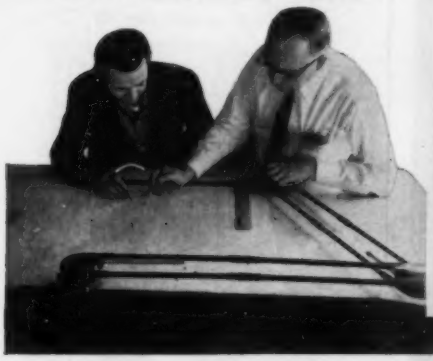

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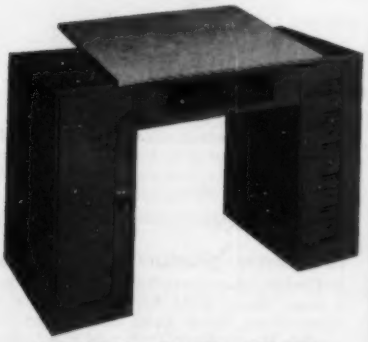

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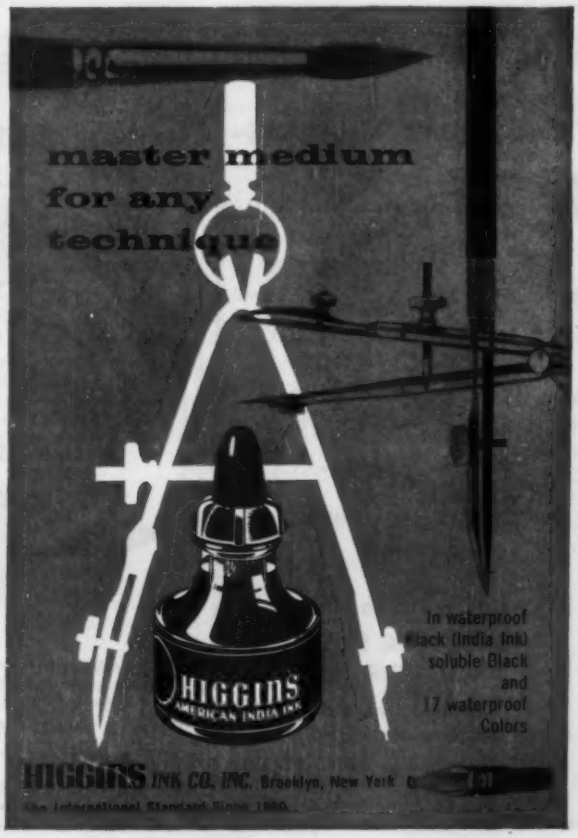

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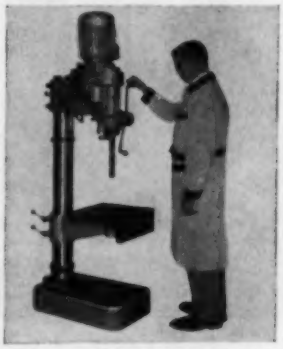
SHOP EQUIPMENT NEWS

(Continued from page 80)



Boice-Crane Swedish-Built Geared-Head Drill Press

only has a vertical ground face 15¾ by 5¾ in., provided also with T-slots. In addition to the combination hand- and power-feed model stocked, a solely hand-feed model is available on special order. Literature is available.

(For further details encircle index code 0504)

safety pilot system From Johnson Gas Appliance Company, an optional safety pilot system which can be specified for use with their No. 120 Heat Treating Furnace. The new system was designed for the convenience and safety of student operators. It will eliminate backfire when lighting the

New Safety Pilot System

furnace, and automatically shuts off the gas if the flame goes out — considered an important safety feature, specially in the school shop. More information available.

(For further details encircle index code 0505)

four new products From The Black & Decker Manufacturing Company, their 8-gauge Heavy-Duty Portable Nibbler, the Heavy-Duty Saber Saw, the 2-speed Reversible Heavy-Duty Drill, and the 2-speed Magnetic Drill Press — all of them exhibited and demonstrated during the Western Metal Show held recently in Los Angeles at the Pan-Pacific Auditorium — in addition to a display of their complete range of metalworking electric tools including shears, screw drivers, impact wrenches, drills from ¼ in. to 1¼ in., tappers, disk, belt, and orbital sanders; bench, portable, and die grinders, saws, and jig saws. For further information on the performance of these tools and prices, write to the manufacturer.

(For further details encircle index code 0506)

(Continued on page 84)

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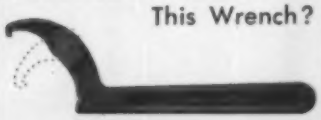

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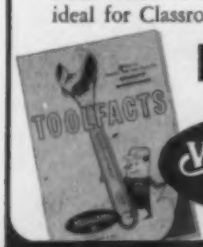

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SHOP EQUIPMENT NEWS

(Continued from page 82)

grinder for school shops From Delta Power Tool Division of Rockwell Manufacturing Company, their new ½-h.p., 7-in. grinder incorporating safety devices that provide maximum protection to students. It is available in both bench and pedestal models. The unit's patented

Delta 7-in. Grinder

"Twin-Lite" safety shields contain double-strength, shatterproof glass to protect the student's eyes, even if he fails to wear protective goggles. Inside the shields, bayonet-type bulbs are shaded to prevent glare while illuminating the face and both sides of the wheel. Wheels are balanced to 1/10 inch-ounce. Included also are removable steel plates covering the sides of the wheels, adjustable spark deflectors, large (2½-in. diameter) cupped wheel flanges, and heavy cast-iron guards with integral dust chutes. The single-phase motor is a capacitor-start, 115/230-v., ½-h.p. unit with double-sealed ball bearings plus an extra seal to keep abrasive dust out. It is available in 1725- and 3450-r.p.m. models. Three-phase motors are also available. Additional information to be had.

(For further details encircle index code 0507)

educational electronic kits From General Electric Company, seven educational projects engineered to General Electric standards in every detail, designed for teaching and self-education. Divided into two categories — three are experimental laboratories, use of which leads to a basic knowledge of electricity, electronics or transistors — the other four kits providing similar educational advantages but result in a product which can be enjoyed for many years.

Because educational value is a prime consideration, each kit includes a manual containing not only step-by-step construction details but also the scientific principles involved. The manuals are organized on the "graded" principle with each point made and each step performed leading to the next in logical sequence. Every step is done by the student.

The "Educational Project" kits included in the company's initial move into this new product area are: transistor lab (Model EL-10); basic electricity lab (Model EL-20); advanced electronics lab (Model EL-30); project transistor radio (Model EF-110); project transmitter (Model EF-120); project intercom (Model EF-130); project analog computer (Model EF-140). All tools necessary for construction of the project or performance of experiments are included in each kit.

Present scheduling will put the kits on the consumer market in June.

(For further details encircle index code 0508)

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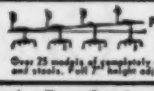

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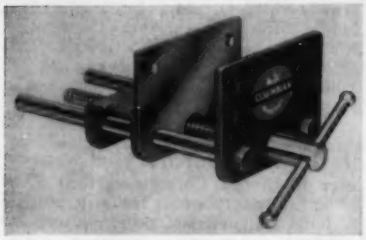
woodcraft vise From The Columbian Vise & Manufacturing Company, this strong and easy to use vise, known as No. 6C, includes numerous new features. Among these are chrome-plated steel handles, and

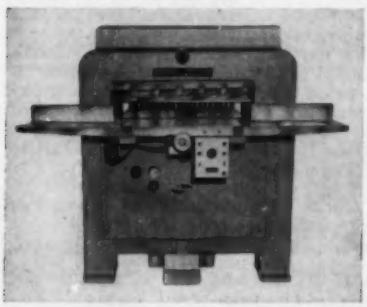


Woodcraft Vise

handle balls forged from handle stock. Jaws are fabricated steel with plated cold rolled steel screw and screw head and malleable iron nut. Holes are provided for attaching wood faces, if desired. The vise fits benches up to 2¼ in. and is provided with precision slots for mounting. The 6C has 3 by 6-in. jaws, 7-in. jaw opening, and weighs 10 lb. Please write for further details.

(For further details encircle index code 0509)

power paper cutters From Challenge Machinery Company, two new models of 30½-in. Champion Power Paper Cutters offering fast, automatic cutting for printers and duplicator operations. First of



Model 305MCD Automatic Cutter

these is an Automatic Cutter, Champion Model 305MC, featuring automatic knife and clamp operation. With this model, when the two control buttons are pushed, the clamp and then the knife come down automatically. Releasing the controls causes the knife and then the clamp to return to starting position. The clamp can also be operated independently by means of the foot control pedal. The second new Champion Model (shown) is an Automatic Cutter with a power operated back gauge and an automatic spacer — Model 305MCD. This model is ideal for shops having a large amount of closely-spaced repetitive cutting work, such as labels, coupons, or small forms. For further details ask for Publication No. 650.

(For further details encircle index code 0510)

soldering gun From Portable Electric Tools, Inc., this new soldering gun — the Shopmate SG-125B — plugs into any a.c. outlet for immediate heat. It features a rigid single-pole, with extensions up to 12 in., which makes it possible to solder in normally inaccessible areas. Some of the capabilities are: repairing light fixtures,

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

Soldering Gun

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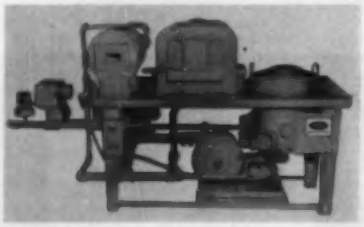
(For further details encircle index code 0511)

heat-treating furnace From Sunbeam Equipment Corporation, their triple-purpose heat-treating furnace — Model TP-D — which performs practically every heat-treating operation: hardening, forging, welding, tool dressing, annealing, normalizing, pack carburizing, and nonferrous



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metal melting. Versatile and adaptable for use in toolrooms, small shops, and schools, this three-furnace unit consists of a pot furnace, an oven, and a forge, and is available for gas-fired heating in five standard sizes.

(For further details encircle index code 0512)

face shield From General Scientific Equipment Company, their new face shield — the Mark I — that is especially valuable in protecting eyes, face, and under-chin area, and particularly adapted to operations where splashing is a problem. Primary use will be by the chemical and oil

Face Shield — The Mark I

industries and wherever full face coverage is required against acids, chemical sprays, foreign particles, and other fragments. Worn with a safety helmet the shield is lightweight, and affords full, wide, unrestricted vision and audibility. It fits all safety helmets, and is 16 by 9 in., with .040-in.-thick visor for impact resistance. Other sizes can be made for special applications. For complete information ask for Bulletin No. 17.

(For further details encircle index code 0513)

electronic laboratory From Superex Electronics Corporation their Electronic Laboratory which makes it possible to build 18 different projects, such as transistor radios, code oscillators, solar-powered devices, and a tester, among other items. Simplified templates and solderless

screw terminals enable anyone who can read to build, and rebuild all the circuits with only a screw driver. The electronic laboratory features mounted components for durability, solderless screw terminals, precut jumper leads, and 18 templates for ease of assembly. Due to its versatility, durability, safety, and low cost, the Electronic Laboratory provides an excellent basis for an introductory course in electronics, for junior high schools, scout troops, etc. Please write for further details, or for a copy of a free catalog from the manufacturer.

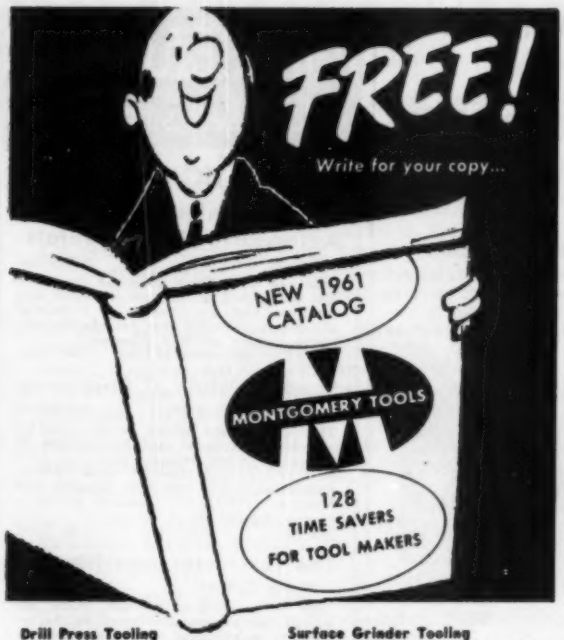
(For further details encircle index code 0514)

satin-chrome steel tapes From The L. S. Starrett Company, a ⅜-in.-wide tapeline made of high-quality tempered tape steel with a hard-wearing, corrosion-resistant, multiplate, satin-chrome finish. Graduations and figures are bonded to the

Starrett Satin Chrome Steel Tape

steel and recessed below the satin-chrome finish for durability and readability. Graduations are in feet, inches, and eighths with red foot figures before every inch mark to show total feet and inches at a glance. Cases for these new No. C530 Series Satin Chrome Steel Tapes are electroplated steel sections covered with wear- and weather-resisting red vinyl secured by a

(Continued on page 88)



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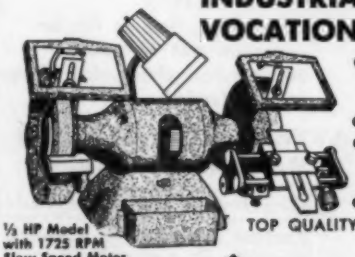

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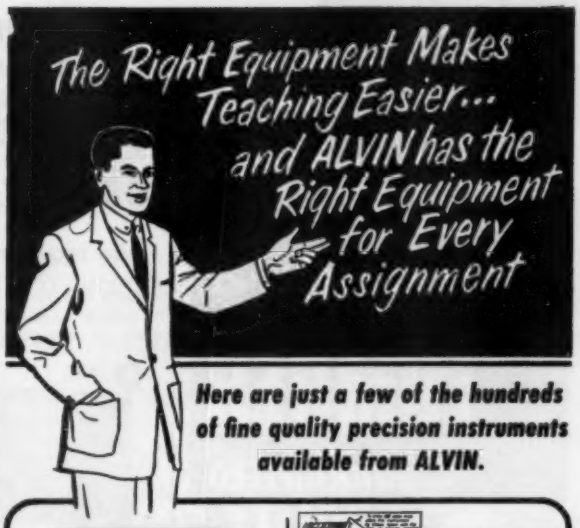

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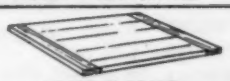

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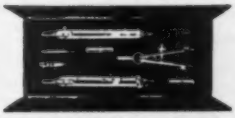

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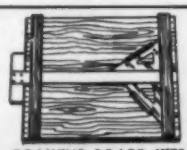

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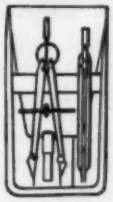

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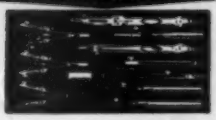

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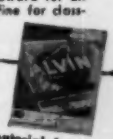

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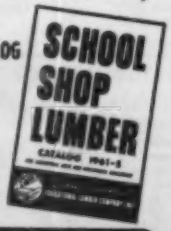

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SHOP EQUIPMENT NEWS

(Continued from page 86)

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(For further details encircle index code 0515)

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Knight Kit R-55 Receiver

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(For further details encircle index code 0516)

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(Continued on page 91)

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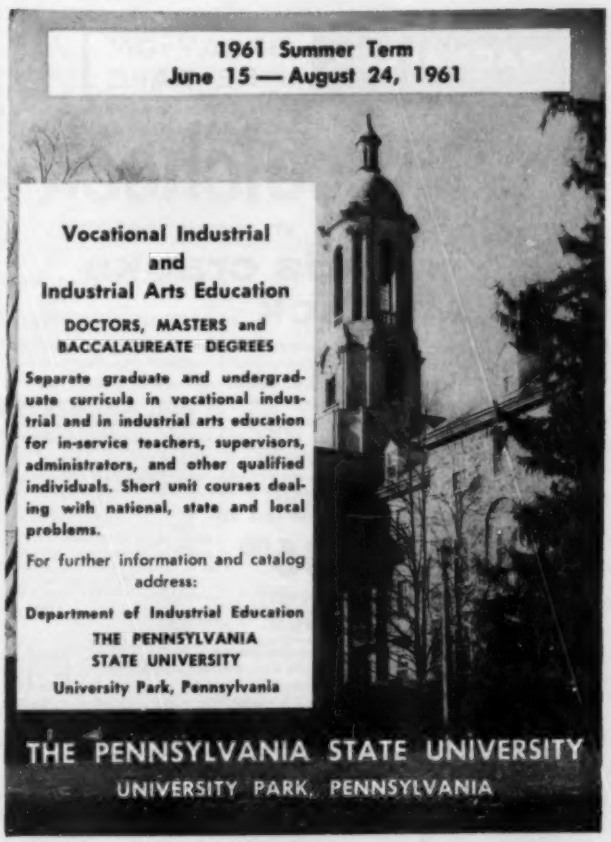
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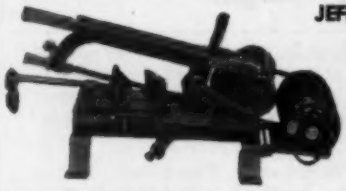

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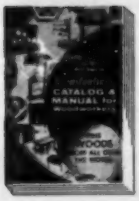

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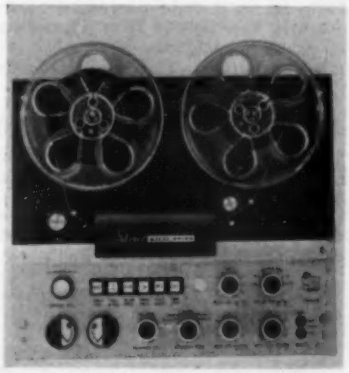
SHOP EQUIPMENT NEWS

(Continued from page 88)

hogany, birch, and similar hardwoods. Complete information, including finishing instructions and prices, are available from the manufacturer.

(For further details encircle index code 0517)

transistor tape deck From Electronic Instrument Company, their new Stereo/Mono 4-Track Tape Deck for professional and home use. It incorporates well-planned goals, namely: that progressive deterioration would be fought out of



EICO Tape Deck

the design; that quarter-track recording would be made as reliable and as high in quality as half-track recording had ever been at the same speed; and that professional features would be included in a simple-to-operate and foolproof design. Its many high-quality features include 14-transistor playback, amplifier, and record electronics, with separate push-pull bias-erase oscillator and full-wave rectifier; a hysteresis synchronous capstan drive motor and two heavy-duty 4-pole induction reel motors. The entire transport mechanism is of great simplicity. There are only three mechanical linkages in the deck. Further information on many other features of the RP-100 is available. It can be had fully wired and thoroughly tested; or as a semi-kit, with the entire tape transport fully assembled and tested, with the electronics in kit form.

(For further details encircle index code 0518)

high-speed computer equipment From Recordak Corporation, a subsidiary of Eastman Kodak Company, the Recordak DACOM System, which makes possible

High-Speed Computer Equipment

high-speed recording of information from computers. The new system derives its name from *DA*tascope *C*omputer *O*utput *M*icrofilmer. It converts information from magnetic tape into plain language on micro-

(Continued on next page)

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SHOP EQUIPMENT NEWS

(Continued from previous page)

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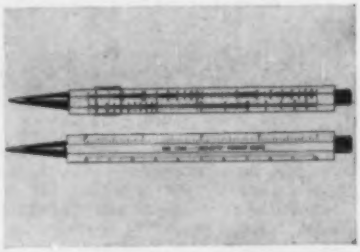
(For further details encircle index code 0519)

combination slide rule and pencil From Alvin & Company, Inc., this combination slide rule and mechanical drawing pencil, called the "Jeff-Ette," for use by engineers, contractors, architects, draftsmen, as well as businessmen and students. This slide rule has A, B, C, and D



Slide Rule and Pencil Combination

scales on face, and the sides of the rule incorporate a 4-in. drawing scale divided into 32nds and a millimeter rule up to 10 centimeters. It performs multiplications, divisions, squares, and square roots. Small cursor unit has spring tension and fine hairline. "Jeff-Ette" is also a smooth-writing mechanical drawing pencil 6 in. long, 7/16 in. wide, and 3/8 in. thick, complete with spring pocket clip, and with leatherette sheath. More information available.

(For further details encircle index code 0520)

veneer glue From Albert Constantine and Son, Inc., to enable handyman to resurface scarred furniture with beautiful real-wood veneers. The new product — Constantine's Veneer Glue is a liquid supplied in a can with an applicator brush. Veneer for the restoration job is 1/28 inch thick, in any color and grain of your

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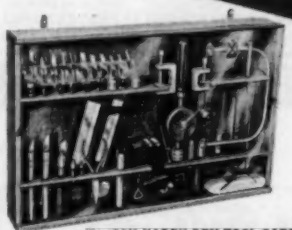

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(For further details encircle index code 0521)

DESCRIPTIVE MATERIAL

From Sax Arts & Crafts (Division of Sax Brothers, Inc.,) their anniversary catalog, No. 62, celebrating their 51st year in business. Containing over 200 letterhead-size pages, various sections such as sculpture, lapidary, and graphics have been greatly expanded. In all, 13 general sections are included in the catalog, covering a multiplicity of subdivisions into various crafts and representing many thousands of items. The book includes the listing of the great variety of both standard and exotic leathers which are available from their stock. Catalog No. 62 available to anyone for 50 cents. Free of charge if requested on institutional letterhead.

(For further details encircle index code 0522)

From Craftools, Inc., a 24-page catalog on graphic arts which includes a comprehensive range of presses, tools, supplies, and handmade papers for etching, woodblock printing and lithography. All items are described and illustrated. Catalog available free to schools, institutions, and individuals requesting it on their letterhead.

(For further details encircle index code 0523)

From R. K. LeBlond Machine Tool Company, Bulletin No. R-206, tells the story of the 21- and 24-in. Regal engine lathes. Includes a description of the forces of turning every lathe must withstand to maintain its accuracy, and the new Regal features that dissipate these forces. Descriptions and specifications of the Regal 21- and 24-in. plain and sliding bed gap lathes are also included. Free copy available upon request.

(For further details encircle index code 0524)

From Borden Chemical Company, their 12-page four-color pamphlet, called "Elmer's Wood-Gluing Handbook," being offered without charge. It includes instructions and helpful hints for gluing projects from heavy construction and home improvements to cabinet and furniture assemblies, models and toys, and sports equipment.

(For further details encircle index code 0525)

From Brodhead-Garrett Company, their 1961 catalog, listing more than 20,000 items for use in industrial arts, vocational education, crafts, and fine arts work. Many new items are included. This 496-page catalog containing an easy-to-use and complete alphabetical index at the back, presents the equipment and supplies available from this company in the broad fields of school shop furniture and equipment, hardwood lumber, and the newest as well as the old stand-bys in supplies.

(For further details encircle index code 0526)

(Continued on next page)

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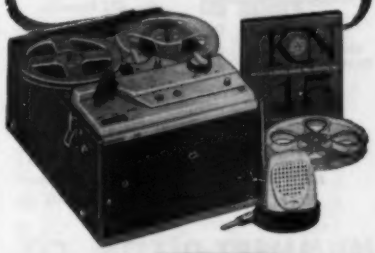

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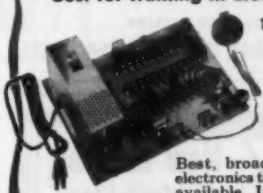

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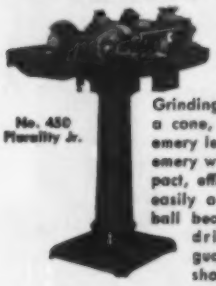

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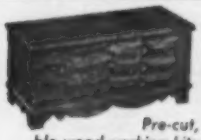

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Di-Acro Corporation of Lake City, Minn., announce the recent purchase of Seco Electronics Inc., Minneapolis. Seco Electronics is now a wholly owned subsidiary of Di-Acro Corporation, but will continue to operate with present management under its own name. They manufacture specialized electronic test equipment.

Di-Acro Corporation (formerly O'Neil-Irwin Manufacturing Company) makes a complete line of precision metalworking machines that bend, roll, notch, punch, and shear metal sheets and bars.

DeWalt Inc., has named district sales managers for its Minneapolis, Cleveland, and Atlanta sales territories, to become effective immediately. James W. Anderson will be responsible for sales activity in Minnesota, North Dakota, and South Dakota, with headquarters in Minneapolis; L. John Roosa, Jr., will be responsible for sales activity in Ohio, excluding the southwest corner, with headquarters in Cleveland; and T. Lamar Hart will co-ordinate sales activity in the southeastern United States, with headquarters in Atlanta.

The Black & Decker Manufacturing Company announce the election of Robert C. Tyo to the newly created position of vice-president of DeWalt operations. The board's action was related to Mr. Tyo's recent election to the presidency of DeWalt, Inc., Lancaster, Pa., a Black & Decker subsidiary.

Henry S. Thomassen, former industrial educator editor of the McGraw-Hill Book Company, has accepted the position as editor-in-chief of the Webster Publishing Company of St. Louis.

The P. A. Sturtevant Company, manufacturers of precision torque wrenches, have designed a special scale for use on their golden torque wrenches which are awarded to the chief mechanics of winning cars in drag-racing events. It was designed in cooperation with the National Hot Rod Association, and bears its crest in full color.

Educational Electronics Division of Thompson Ramo Wooldridge, Inc., recently moved their offices from 126 Fifth Ave., New York City to a new building in Englewood Cliffs, New Jersey. Located at 532 Sylvan Ave., the newly formed division will operate their sales and product development offices.

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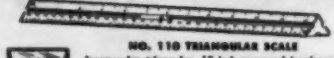

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION — May, 1961
400 North Broadway, Milwaukee 1, Wisconsin

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55	512	519	526	533	540	547	554	560	566	572	578	584	590	596	5102									
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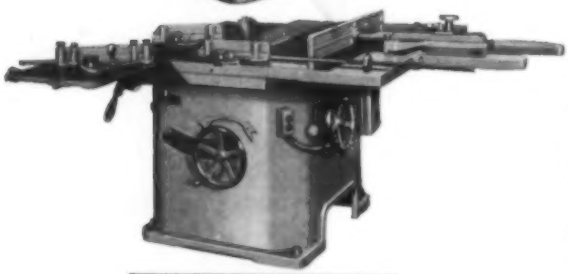

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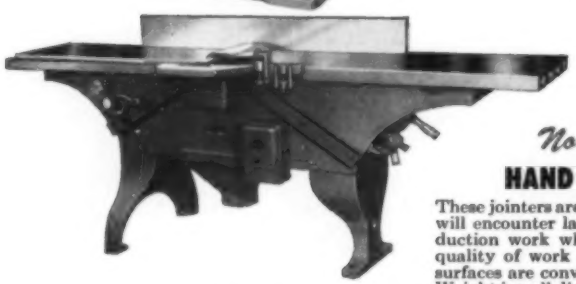

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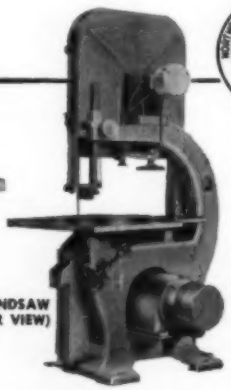

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